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EDITORIAL NOTES.

1902

A Retrospect.

THE year which ends to-morrow will be remembered by all living, and be marked in history, as a wonderful year for the British Empire. We are so close to its memorable events, and these are so numerous, that it seems more than usually vain to attempt at this time to chronicle them in order of importance. Yet it is our duty to essay this task, inasmuch as at this season it is the immemorial habit of mankind to glance backward over the year's flight; and journalism is nothing if it fails to mirror the thoughts of those to whom it appeals as (among other things) an aid to memory and a support for reflection. The year found the Empire prosecuting a lingering war of supremacy to a foregone conclusion which was as yet vexatiously delayed. It watched the people of All the Britains calmly, and with the silent determination characteristic of the race, and unknown to others, pursuing what they conceived to be their destiny, regardless of every antagonistic consideration. Neither the voice of faction here at home nor the outpourings of foreign jealousy and hatred were permitted to deflect the Nation's ordered course by a hair's breadth; and at last the end came. For the first months of the year, the country, by its chosen and responsible Government, continued to show the rest of the world how to make war; and thereafter it was occupied with the even harder and more complicated task of making peace, as peace was never made before. In the midst of this, during an all too brief season, when no Briton the world over had occasion to fire a shot in anger, King Edward the Seventh and his beloved Queen Consort were to have been crowned, with a degree of pomp and popular jubilation of which all previous English Coronations had only contained the germ and indicated the form and the ceremonial. The entire world and the glory of it were laid under willing tribute to enhance the solemnity, and the magnificence, and the meaning of the most stupendous function of the kind in history. It seemed to the more thoughtful of those who witnessed these preparations that the representation of earthly "might, majesty, dominion, and power" was being carried near the point of endurance of mundane provisions; and, at the very culmination of all these arrangements, the Master Hand intervened, and the dignity of sorrow and suffering was added to all that human effort had done in its own way. For weeks the Monarch of All the Britains and his patient people lay under the Power which overrules all things; and when, in a mercifully shortened time, the King was restored to his place again, the Coronation that was performed was indeed the most wonderful in history, but the grandeur of it was of a different kind.

Unhappily, the cessation of hostilities in South Africa was followed in the latter part of the year by fresh wars for the defence of the British Empire and the vindication of the law of nations in East Africa and Central America. The lesson of these occurrences is that the cost of carrying on the Empire, and protecting the enterprise and commerce of its peoples, can never be a light charge on the financial resources of the head of this wide dominion, which is the British Isles. Hither in the end comes the wealth of empire; and this must be guarded and insured beyond the remotest risk of forcible diversion. The national credit has borne the strain of war without any inconvenience being felt by either trades or persons, notwithstanding the fact of the income-tax having been raised to 1s. 3d. in the pound. In the necessity for finding additional sources of revenue, Parliament restored the old duty of 1s. per quarter upon imported corn. The export tax of 1s. per ton on coal, of which all sorts of evil had been predicted the previous year, when it was imposed, proved a profitable impost; and it is not likely to be relinquished. Although the very heavy cost of the Boer War has been relieved, Parliament has this year reformed and recast the whole scheme of popular education, upon lines that must infallibly bring an additional burden upon the tax and rate payer. It is therefore not likely that the country will experience the blessing of Peace in the particular sense of a great saving of rates and taxes.

In regard to rates, by which is to be understood all local taxation, the year witnessed a remarkable growth of public interest in the finance of local self-government. The enormous amount of what is called the local national debt, and its rapid increase, and the accompanying increase of the rates, together constituted the principal topic of controversy and comment in the field of domestic politics. It may be stated, as a feature of the year, that during its course public opinion of the more instructed kind began to turn against the fashion of Municipalism which came in with Mr. Joseph Chamberlain's triumphal progress from the Council Chamber of Birmingham up to the Cabinet at Westminster. This revulsion of feeling from the culminating point of the Electric Lighting Act of 1882, which assumed that municipalities which were only enterprising could not go wrong, was prepared for by certain municipal scandals and disappointments of several years' growth. The recklessness of local authorities in plunging into all sorts of trading adventures, especially in regard to electricity supply, which were of a highly speculative character, was recognized by the results exhibited in certain instances; while the increase in the rates, notwithstanding the growth of the rateable property in value, began to occasion uneasiness. A powerful series of articles exposing the socialistic side of municipal trading was published in "The Times."

The summer was dull and cold; and there was in some of the national industries a falling-off of employment, and a consequent decline of wages, such as had not been registered since 1895. Prices of coal held firm, considering all things; and supplies for gas undertakings could only be contracted for in the season at about 1s. per ton easier than the previous year's terms. The Miners' Unions were much concerned through the entire twelvemonth to prevent a general lowering of wages. There was a reduction in the Scotch field; but strikes in France and in the anthracite regions of the United States probably prevented the weakness from spreading, and helped to keep the coal market firm. Meanwhile, the value of most gas-works residuals suffered material diminution. Coke could only be sold at a low rate, though at this price it went off fairly well. Tar was disappointing, in that all the vaunted progress of chemical industry, starting from tar as the raw material, failed to raise this material far above its fuel value. The only tar product that really was in great demand was pitch, which became very dear—in consequence, it was said, of the large quantities required for electric main laying and street tramway construction. Sulphate of ammonia seemed to increase in favour with British agriculturists, thanks largely to the unremitting assiduity of the Sulphate Association; but still complaints arose that the machinery for distributing it was defective. The market value of this product seems to have settled down to a pretty constant figure. At least, there are no "incidents" in this trade nowadays, which must be a considerable relief to manufacturers. One of the features of the year was the notable cheapness of gas oil, which was offered for long periods on remarkably low terms. In the very early part of the year, the first cargo of oil from a new field that had just been exploited in Texas arrived in England. Shortly afterwards there was great talk of Texan oil; and a "boom" of the most approved description was duly organized. Owing chiefly to the machinations of interested parties, there was a revival of the suggested use of this kind of oil as liquid fuel, instead of coal, for railway locomotives and steamships. The slightly older trade in oil from Borneo did not prosper so well; there being many complaints of the quantity of water sent with it. What the permanent value of the Texas field may prove to be, remains problematical for the present.

A good deal of nonsense was current during the year concerning the imagined superiority to the British of foreign

methods of finance and transacting business, which were alleged to be diverting trade from this country to the United States and Germany. It became the usual thing to contrast British stupidity and lack of enterprise with American smartness and German scientific industrialism. The magazines and newspapers were full of this kind of incentive to the native spirit of enterprise, supposed to be quite dormant. The circumstance that a period of very severe industrial depression overtook Germany during the year, somewhat checked this fashion; and the failure of United States operators to carry out their engagements was equally disconcerting. American capital and American engineering skill were going to revolutionize the systems of railway transportation in Central London; but nothing of the kind has yet happened. The appearance on the English horizon of the American "trust" or "combine" system, with the sufficiently ambitious object of monopolizing the carrying trade of the North Atlantic, was a portentous sign of the times. The firm establishment in England of large branches of the two greatest American engineering firms, is likewise to be chronicled as evidence that the natural advantages of this country as regards industry and trade are not near exhaustion, in the opinion of competent judges.

In regard to the British gas industry generally, the year may truthfully be described as one of very substantial and anticipated progress. Great schemes for the taking up of land for the gas-works purposes of a future generation were promulgated in respect to London and Birmingham; while rapid progress was made with the extension of the immense works in hand for the better supply of Edinburgh, Glasgow, Newcastle-on-Tyne, and a host of other flourishing and important industrial and residential centres. The pages of the "JOURNAL" for the year were full of illustrations and descriptions of new and improved gas-works which are springing up on all sides. It used to be simple, when engineering pilgrims from afar came to England to see what might be going on in the way of the most improved gas making, to direct them to the few places where progress was most signally marked; but the difficulty now is to leave out the many good examples which are well worth seeing. The cause of cheap gas, suitable for all purposes of lighting (chiefly by incandescence), heating, and the generation of power, has taken hold of expert opinion in a way that can only be rightly described as marvellous, considering the short time that has passed since it was formulated; and gas-works are being enlarged to deal with the expected greater demand. The circumstance that the case of high illuminating power gas was given up during the proceedings of the parliamentary session by the London County Council, who had defended it two years ago, is an historic event. Less satisfactory, however, is the persistency of some sort of agitation over carburetted water gas, which is produced by many gas companies for what they consider good and sufficient technical and economical reasons. A report on the supply of this kind of gas in London was published; and a Government Bill for the regulation of gas manufacture, aimed at this product, was introduced in the House of Lords. The fashion of gas stock consolidation was again pursued in many additional cases, with good results.

The year's history of the London Gas Companies would fill out all the space we can allow to this review of the whole British gas industry. The financial record calls for notice first. Beginning the year almost at par, the Gaslight and Coke Company's ordinary 4 per cent. stock soon began to weaken, and at the end of the March quarter it was quoted 91-93; at the end of June it had improved to 94-96; at Michaelmas it was down again to 87-89; and it is now marked 84-86. South Metropolitan 4 per cent. ordinary stock began the year at 123-125, and left off at 116-119. Speaking generally, gas stocks did not improve in value during the year, though there are exceptions. The Commercial Gas Company were in Parliament for general powers, and offered to take the modified form of resettlement into which the recommendations of the Powers of Charge Committee were cast by the South Metropolitan Act, 1900. In this, they secured a large measure of success. The illuminating power of the Company's gas was reduced from 16 to 14 candles; but the mode of testing was left open, with the result that the London Gas Referees have made a difference in their case from the method applying to the South Metropolitan Company's 14-candle gas. The Company are bringing forward another Bill to rectify this matter. The South Metropolitan Gas Company promoted a Bill to enable them to make a considerable forward provision for the extension of their East Greenwich works, to abolish the Referees, and to increase the remuneration payable to the Directors. It transpired that the object of the latter provision was to enable the ordinary system of gas company administration to be changed in the direction of the appointing of a highly-paid President, who should give practically the best of his time to the business of the Company. This was carried, and a portion of the desired additional land was granted; but the part of the Bill relating to the Referees was rejected. The London County Council have given parliamentary notice of a renewed attack upon the method of testing the Company's gas. The Gaslight and Coke Company had no Bill in Parliament last session; but they are promoting one for next session, offering some concessions on the lines of the recommendations of the Powers of Charge Committee. On the other hand, the London County Council have a Bill directed against the Company, and seeking a compulsory reduction of the illuminating power of the gas to 14 candles, upon the terms accepted by the South Metropolitan and Commercial Companies. Friction arose between the Referees and certain of the Companies in respect to the service-pipes of the testing-stations; and latterly the London County Council have decided to institute Sunday testing at those places. The site of the old Pimlico station of the Gaslight and Coke Company was sold, and the works there, which were no longer required, demolished. The South Metropolitan Company obtained a valuable precedent in Local Authorities' Electric Lighting Provisional Orders, requiring that undertakings established under such Orders should pay their own way. The much-needed Patent Law Amendment Act was passed during the session.

In Outer London, the West Ham Gas Company obtained a fresh Act on reasonable terms, including the reduction of illuminating power from 16 to 14 candles, in consideration of the lowering of their old initial price by one penny. Southport obtained relief of the same kind by Provisional Order. An attempt by one or two small Provincial Gas Companies to pre-empt the manufacture of "power gas" was defeated; it being decided that all schemes of the kind must be dealt with by Parliament upon the merits. The Devonport gas undertaking passed by arbitration into the possession of the Corporation; and there was an interesting arbitration at Morecambe. Arbitrations were also held in respect of the Poulton-le-Fylde gas and Rhymney gas and water properties. The South Staffordshire Mond Gas Company was started; and the coke-oven gas plant at Everett (Mass.), which had been much advertised, passed into the hands of a Receiver. The Manchester Corporation Gas Department made a new departure in offering gas for power purposes at a substantial reduction of price. There were remarkable gas consumers' agitations, on the old grounds of overcharge, and so forth, in the Corporation-supplied cities of Perth and Manchester; and some discontent arose with the condition of the Corporation gas estate at Halifax. The subject of Gas Companies' income-tax assessments and allowances was ventilated during the year. The resettlement of the Paris gas supply was in progress throughout the twelve months; and another scheme, involving a substantial reduction in price, is to come into force with the New Year.

The most momentous event of the year in connection with the technical side of the gas industry was the sweeping alteration effected in the business methods and with regard to the administration of the Welsbach Company. The old directorate and management of this huge concern, having almost crushed the trade of the United Kingdom in incandescent burners and mantles under the weight of their over-capitalization and arbitrary dealings, were swept away, and the administration placed upon a new footing, which included the cordial recognition of the interest of gas companies in economical burners. Matters as regards the dealing of the Company with the public were precipitated by the action of Mr. (now Sir) George Livesey, who headed and raised a guarantee fund for fighting the Company on the merits of their 1893 patent. The effect of this intervention was that the Company agreed to grant licences under this much canvassed patent on easy terms, which practically threw the whole trade open. Consequently, the year has witnessed a very great expansion of incandescent lighting, on various systems. Competition, under the watchful eye of Mr. C. C. Carpenter and other large users of the burners, has vastly cheapened and improved these appliances from the point of

view of consumers; while the search after the best mantle has been vigorously prosecuted. High-power lighting for open spaces and streets has made fair progress, notwithstanding the severe competition of electric arc lighting on the one hand, and the Kitson oil-lamp on the other. Additional systems of what may be classified as assisted gas lighting are coming forward, claiming a duty of 45 candles per cubic foot of gas consumed, which appears to be high-water mark for the present. Suggestions continue to be made respecting the method of manufacturing the cheap gas, of low illuminating power but of calorific value not much inferior to that of ordinary coal gas, required for the staple of the gas industry of the future. Professor Lewes has proposed a mixture of water gas with nascent coal gas; and Mr. C. B. Tully, at Sligo, has worked upon a similar scheme on lines indicated by Professor Lewes. Dr. Besemfelder, in Germany, has described means by which something of the same kind might be done; but the subject has not emerged from the experimental stage. Otherwise, gas manufacture from coal, and carburetted water-gas production, continue on the established lines. The carburetted water-gas plants on the Lowe principle hold their own, because as used in the United Kingdom they can make a product of comparatively low as well as of the high illuminating power for which they were originally designed. Where enrichment is practised apart from production in bulk, benzol seems to be the latest gain on this line. Some valuable data concerning retort-oven working were published on the authority of Herr Hilgenstock. The construction and use of large gas-engines made progress, and was recognized as one of the main points of modern mechanical engineering development. Nothing new was achieved in the way of gas heating; and gas cooking-stoves have become so standardized that there is nothing fresh to be said concerning them. The inverted incandescent gas-burner was brought out.

Of miscellaneous inventions and novel appliances more or less germane to the gas industry, mention may be made of the Nernst electric incandescent lamp, which was put upon the market, and the Bremer flaming arc lamp, which made its appearance in England, and is greatly admired. The use of acetylene for lighting has had many difficulties and drawbacks to contend with; and evil days overtook the carbide of calcium industry. It is reported, however, that acetylene is looking up again, as the reward of certain improvements effected in the appliances and accessories connected with its utilization for various purposes. An improved system of portland cement manufacture has taken shape, and is reputed successful; but as it dispenses with coke fuel, this is not particularly good news for gas companies. Serious proposals have been made for the extended use of tar macadam on the high roads; and some experiments in this line have been instituted, with results not yet reported. The fashion of water-tube boilers increased very noticeably. The employment of reinforced concrete construction for engineering and building purposes grew in favour. The modern preference for electric power distribution in factories and workshops was ministered to by many electricity-supplying authorities offering current for this purpose at less than cost price. The naphthalene trouble still persisted, to the great vexation of gas companies in sundry places. Notwithstanding the continual discovery and free publication of naphthalene cures, the Southern District Association of Gas Managers, who, under their President (Mr. W. E. Price), were engaged in concerting measures for grappling effectually with this affliction of the gas industry, did not find this occupation superfluous. A curious device published during the year was for burning gas under water. A strong effort to develop the industrial use of alcohol for lighting and other purposes was carried on in France and Germany.

The gas litigation of the year does not make a long record, and there was no very notable case in the list. The Gaslight and Coke Company fought out the question of whether the nominal increase of capital consequent upon stock conversion is liable to stamp duty, and found (up to this stage) that it is. *Hussey v. The Gaslight and Coke Company* raised a question of the right of a Receiver in possession of property to a continuing supply. The case of *Waters and Wife v. Brighton and Hove General Gas Company* turned on the question of negligence in connecting a supply to defective old fittings. A curious point of land valuation arose in the experience of the North Pembrokeshire Gas and Water Company. The Rickmansworth Urban District Council learnt that there are statutory limits to the representative quality of such bodies. The law as to the custody of the money deposited in prepayment meters received conflicting interpretations in cases arising at Longton, Chester, and Newport (Mon.). The flow of litigation under the Workmen's Compensation Act turned during the year; and it seems evident that there will not be much more of it, as the commoner grounds of dispute are cleared away. On the other hand, there are scarcely any additions to the number of "mutual schemes" favoured by the Act. Whereas not long ago controversy about the Act was a standing dish in many journals, now it is scarcely ever mentioned.

Early in the year, the practical tendency and the motive power of Trade Unionism once more attracted public notice; and a good deal was said about these matters under the title of "The Crisis in British Industry." It was shown on cogent evidence that the essence of Trade Unionism is restraint of trade. About the same time, a series of heavy blows began to fall from the judicial bench of England and Ireland upon the outposts of Trade Unionism. Picketing had been found illegal before, by the name of "besetting," though under the Society name it had escaped condemnation. It had grown to be an article of belief among the professional Trade Unionists that these societies could not be made legally responsible for the acts of their officials and agents; but this faith was rudely shattered by the judgment on the appeal in the Taff Vale case, which raised this point. A case from South Wales, arising out of the custom of the miners' "stop-day," was decided in a way that exemplified the independence of the judicial mind. All through the year cases illustrating the bent of Trade Unionism continued to crop up; and the great Taff Vale action itself occupied the High Court for many days before Christmas. Outside the Courts, the course of Trade Unionism has been much as usual. Strikes and threats to strike have been numerous enough, but always in a small way in this country. With a failing employment market almost general, outside coal mining, the influential leaders of Labour have hesitated to take their men out. A ludicrous performance of the Gas Workers' Union at Llanelly in the autumn, only covered with confusion all those who took any part in it. An allegation that the bricklayers in the employment of the London County Council systematically idled away their time, failed of rebutting evidence. Serious strikes in France and the United States helped to remove the impression that the Trade Union which is organized for the restraint of trade is peculiar to this country.

The year's history of technical institutions is of the most satisfactory character. After many preliminary negotiations, and by dint of much patient and tactful effort, the Institution of Gas Engineers and the Gas Institute agreed to dissolve and re-form as a united Society. The stages of these proceedings were spread over a considerable period of time, and the final steps were only taken so lately as Nov. 29. As the course of these transactions is so fresh in the memory of our readers, it is only necessary to chronicle the pleasing fact that the utmost good feeling characterized the operations for the final closing up of the ranks of the gas engineering profession and the obliteration of a division that had long ceased to possess the smallest justification. The usual meetings of the National and District Associations of gas managers were held, and did good work. A fresh feature of this side of the gas industry is the movement in favour of Junior Associations, intended for the benefit of students and the younger followers of the industry, which shows much promise. So far the idea has only been realized in the district of which Manchester is the centre; but it is understood that a scheme is in hand for the formation of such an Association for London and the Metropolitan area. It is obvious that the chief obstacle to the successful working of an organization of this kind is the topographical one, seeing that the number of possible centres whither a sufficient number of gas engineering students can conveniently resort is strictly limited. The total neglect of anything like systematic technical instruction for young gas managers' assistants which has been hitherto chargeable to the National Associations, is an omission which under the new dispensation may be repaired. A noble gift in the interest of general technical instruction was made to the city of Exeter by Mr. H. A. Willey, in the shape of a fully-equipped Manual School.

The reform of the method of recompensing labour with which the name of Livesey is identified grew in strength

where it has been adopted, although new applications come very slowly. But this is perhaps not altogether to be regretted, for the reason that in matters of this nature the gas industry does not retrace steps once taken. Reductions of wages in gas-works are unknown, and it is therefore all the more necessary that the ground for any advance should be made as secure as is humanly possible beforehand. A notable piece of evidence as to the success of the South Metropolitan and Crystal Palace District Gas Companies' system was afforded by the remarkable gathering at the Crystal Palace for the welcoming home of the reservists and volunteers in the employment of these Companies who went to the front at their country's call. The record of what was done in connection with this stirring incident is one of which all concerned may be proud; but it would take too much space to recount it here. As regards the development of the South Metropolitan profit-sharing scheme, the workmen now hold £160,000 in the Company, which is, in all probability, absolutely to be credited to the scheme. The Crystal Palace District Company's scheme is likewise doing very well; the men having to their credit an average holding of £30 per head. It is yet early days with the Commercial Gas Company's dispositions of the same order; but it, too, is well reported of. We have not been informed of any other addition to the short list of profit-sharing gas undertakings; but in other industries it is now being tried on various scales. Messrs. Willey and Co. have introduced it; and a bold personal effort was made by Sir Christopher Furness to extend the principle to the large business of Furness, Withy, and Co. The system of paying engineering workmen partly by results, known as the "premium "plan," has been formally admitted this year by the trade. There was no extension of the eight-hour day movement, which is found to be incompatible with any system of payment of labour by results.

There were happily no serious accidents in connection with the manufacture or use of gas for the whole year, with the exception of a governor explosion at Truro. Militant Socialism was disheartened, and as there were consequently no gas-works strikes, so there was an absence of any such mysterious incidents as the gasholder explosion at Cork which, by the way, was never accounted for. Certain cases of damage to gas-mains by sewerage and other road work arose. There were the customary consumers' accidents—explosions and suffocations—the average tale of which is kept up every year by that residuum of ignorance and carelessness which appears to be irremovable from human nature. Some of these latter were undoubtedly attributable to the water-slide pendant, which, though it is fast going the way to the rubbish-heap before the advance of firm fittings for incandescent lights, still lingers on in places. It would be a prudent step if all gas companies undertaking the fixing and maintenance of incandescent burners in private premises would refuse, as already most of them do, to touch any pipe-connection which includes a water-slide pendant. The responsibility of gas companies for fixing every kind of gas apparatus has grown with the extension of their operations for the better service of the public; and they can no longer remain indifferent to the location of flueless gas-stoves, bath-heaters, and burners generally. So far as experience shows, the undertaking by gas companies of incandescent burner installation and maintenance has nowhere entailed any additional burden, though, of course, the risk exists. There are few modern improvements of a necessary or a convenience of life so absolutely devoid of drawbacks as is incandescent gas lighting. On the other hand, the number of electric and oil-lamp fires and accidents keeps up. The figment that the danger of petroleum lamps is connected with the flashing-point of the oil, which is cherished by the London County Council for some occult reason, has not been borne out by the recorded facts; and the frequency of electric main fires is not reassuring as to the future of some systems. Moreover, the fatalities caused by electric currents for traction and lighting are on the increase with the systems to which they can be attributed. Considerable sensation was caused by the death of M. Zola, the great French novelist, from inhaling the fumes of a stove used to warm his bedroom.

Of personal incidents, the year was particularly prolific. The most notable and pleasing to all followers of the gas industry was the knighting of Mr. George Livesey, which was announced among the Coronation honours. Later in the year, among the King's birthday distinctions, Colonel W. T. Makins, the Governor of the Gaslight and Coke Company, received a baronetcy. Mr. H. E. Jones retired from the position of Engineer and General Manager of the Commercial Gas Company, which he has filled with much distinction for so many years, and was succeeded in the engineership by his son, Mr. S. H. Jones. Mr. Charles Hunt, whose name has been for so long a period honourably connected with Birmingham gas supply, retired from his office under the Corporation, and began a new career as a consultant in London. Mr. Henry Hack thereupon became Gas Engineer-in-Chief to the Corporation; and the staff organization was changed. Mr. Corbet Woodall relinquished the office of Consulting Engineer to the Imperial Continental Gas Association. Mr. W. A. M'Intosh Valon retired from the service of the Ramsgate Corporation, to devote himself wholly to consulting practice; and he was succeeded at Ramsgate by Mr. T. N. Ritson, from Kendal. Mr. George Helps resigned the Secretaryship of the Bath Gas Company. Mr. George Winstanley left the Coventry Corporation Gas Department, and was succeeded as Engineer by Mr. Fletcher W. Stevenson. Sir John Aird, Bart., retired from the Board of the Gaslight and Coke Company; and his seat was given to Sir Hugh Owen, K.C.B., late of the Local Government Board.

Death made many inroads into the ranks of the gas engineering profession, which finds itself at this time bereft of lots of members who were active workers a year ago. Prominent among the younger band of leading gas engineers and managers, Mr. W. R. Chester was stricken in full career. On the other hand, Mr. A. Upward and Mr. C. Gandon had done their work. Mr. Charles Sellers was an altogether unique personality of the older order. A most regretted end was that of Mr. E. W. T. Richmond, who was killed by a cycling accident. Mr. Bryan Donkin will not be easily replaced. Mr. J. S. Tamburini had many friends. Professor Ivison Macadam was the victim of a cold-blooded murder. M. Bandsept had made a name by his labours in the field of incandescent lighting. Mr. G. Henderson was for years the real head of the Plymouth and Stonehouse Gas Company. Mr. Robert Bridge, of Doncaster, was a gas manager of sterling worth. Mr. J. Imray had advised many patentees of gas appliances. Professor H. Morton was the acknowledged head of the science of gas in the United States. In addition to these, many bearers of names familiar to our readers passed to their rest.

Our task is completed. It has been longer than usual, for the reason that the memorable events of the past year—in science and industry, national and personal—have been exceptionally numerous and interesting. This fact alone goes to show how much alive is that gas industry which its ill-wishers have declared to be dead or dying, any time these ten years. The pages of the "JOURNAL" have witnessed to the bulk and variety of the matters which followers of the industry are called upon to attend to week by week. They do not diminish as time goes on. The business of gas supply is a bigger thing now than it ever was; and the indications are all in favour of its becoming of still greater importance in the material equipment of the British Empire for the future that lies open before it. When the advantages of this country over its rivals are totalled up, the fact that the gas supply is the cheapest in the world, and ever tends to become cheaper, is an asset which should not be omitted.

The Discovery of the Welsbach Thoria-Ceria Mantle.

The great case in the Austrian Law Courts by which Baron Auer von Welsbach seeks to establish that Bernhard Rund has no claim against him for a share in the profits arising from the Welsbach mantle has ended so far as the hearing is concerned, and the written judgment of the President of the Court is now being awaited. Those who have made themselves intimately acquainted with the Welsbach patent question in this country, and who have taken the trouble to read the report of the proceedings in this case, and particularly of the final evidence published to-day, will recognize the importance of what is divulged and of the admissions made. Therein will be found the only interest in the case so far as English readers are concerned. It matters not to them which way judgment in the case goes; nor do they care whether the improvement which made successful the Welsbach mantle was discovered by Dr. Welsbach before a certain date in June, 1891. But it will be of peculiar interest to

them to know that Baron Welsbach admits that, in his research work, the two cardinal experiments were made at the beginning of August, 1891, from which was produced the mantle which represents "the present incandescent gas-light." This statement will be found in the report of Baron Welsbach's evidence published in to-day's "JOURNAL." Then in the evidence of Dr. Gallia (Baron Welsbach's Counsel), he states: "The new light—made synthetically from 99 per cent. of pure thoria and 1 per cent. of ceria—which corresponds with the patent specification, was first discovered by Baron Auer, he told me, in August, 1891." Again, Herr Ludwig Haitinger, a Chemist and the present Manager of the Austrian Incandescent Gas-Light Company, states that it "first came to his knowledge in December, 1891," that Baron Welsbach had "discovered a new light, consisting of 99 per cent. of thoria and 1 per cent. of ceria." These quotations are taken from the evidence published last week. It will also be seen that an agreement was entered into with Dr. Welsbach for the supply to the English Incandescent Company, of 1000 kilos. of the new lighting fluid, *within sixteen months* of Aug. 8, 1891. It may be remembered that Dr. Welsbach failed in his application for an Austrian patent for his discovery of 1891; it being considered that it was already embodied in the earlier patents. As has previously been pointed out in the "JOURNAL," an application was made for a patent in this country about the same time; but it was afterwards abandoned. Then in 1893 came the celebrated patent under which the English Welsbach Company are working to-day. It was communicated by Julius Moeller from Paris. His claim was for "a hood for an incandescent gas-burner consisting of pure oxide of thorium with a small proportion of oxide of one of the rare metals herein mentioned, prepared as described." The description reads: "In order to produce a hood of this kind, according to this invention, nitrate of thorium, in the purest possible condition, is dissolved in water. To this is added 1 to 2 per cent. of solution of nitrate of one of the other metals above mentioned, preferably uranium." The "above-mentioned" metals are "uranium, cerium, or prazeodymium." This, in a nutshell, is the history of Welsbach improvement at a critical period. Whether the disclosures in the case just concluded in the Austrian Courts will be of service to the mantle trade on this side of the Channel, it is for them to decide.

A Cutting-Off Case.

In the course of the disputes which too frequently arise between gas suppliers and consumers, it is frequently felt by the latter to be a desirable thing to air their real or fancied grievances in the columns of the local papers. There is something to be said in favour of this course—it "lets off steam" as far as the consumer is concerned, and does not do the gas undertaking any particular harm. The pity is that the indignant consumer so often prefers to "hide his light under a bushel" by omitting to sign his name to his complaint—or, as he sometimes terms it, his "public protest." A case has just arisen, however, which the aggrieved one evidently felt demanded more than the customary anonymous letter to the local Press; he therefore called to his aid the pages of "Truth"—the well-known champion of the weak against the strong. The result of this appeal has been that our contemporary has said some very unkind things concerning the officials of the Stockport Gas Department, of whose conduct the gentleman in question (Mr. J. F. P. Lewis) thought he had cause to complain. Needless to say, there are two sides to the story; and the one which appeared in "Truth" was Mr. Lewis's. The other side has been given—in part, at least—in the "Stockport Advertiser;" and as the matter is to be considered by a Sub-Committee of the Gas Committee, fuller particulars will be forthcoming in due course. The point involved is the well-known one of the incoming tenant and the outgoing tenant's gas arrears; and as this is a question which is of importance to every gas-supplying body, and a never-failing source of dispute, it may be of interest to state the facts of the case, so far as they can be gathered from the two statements published. Last month, Mr. Lewis took over a business, by assignment, free of liabilities, against which he was indemnified by the assignors. His attention was afterwards called to the fact that notice of the change of tenancy ought to have been given at the gas office, so that the measure of gas could be taken, and the account made out to the outgoing tenant. Mr. Lewis thereupon, says the local version, remarked that if the account was made up to date and apportioned as between himself and the previous tenant, he would pay it. The account was rendered as requested; and "Mr. Lewis was further informed that it was the rule to settle up with the outgoing tenant before accepting a new one," and that when this account was paid, a deposit of £10 would be required, or a guarantee from the landlord. "Truth" says nothing about Mr. Lewis asking for the account to be sent to him, or of his being informed of the "rule" of the Gas Department, but states that the security was demanded, and an account presented for the predecessor's gas. Mr. Lewis refused to pay the account, but forwarded £10 security. This was returned to him, and his gas was cut off. But the "Stockport Advertiser" says before this was done, Mr. Lewis was asked to give particulars about the previous tenant, which he did not do. "Truth" states that the gas was cut off at dusk, and that Mr. Lewis had perforce to pay the bill. But the other version gives it that it was cut off in the morning, though it is admitted that the result was the same—*i.e.*, the account was promptly settled. This, however, seems a small point to argue about in regard to such an extreme action as stopping the supply of gas. Afternoon or morning, the principle involved is the same.

Called by Another Name.

"Truth" says, with reference to this case, that it is discouraging to find that the consumer of gas and water is as liable to be blackmailed into the payment of other people's debts under municipal management as under the domination of a company of private monopolists, though where the supply is under public control it rests with the general body of the ratepayers to say whether they will tolerate the extortion of money by this "money or your life" process from citizens who do not owe it. These remarks very naturally brought a letter from Mr. T. Bedford, the Secretary of the Stockport Gas Department, in which he said that Mr. Lewis's version was a misstatement of fact. As, however, the writer omitted to point out in what the inaccuracies consisted, "Truth" equally naturally declined to withdraw the term "blackmail," which they had applied to the method adopted for forcing one man to pay another man's debts. No doubt, the strictures of "Truth" were, to some extent at least, due to the statement that the gas was cut off at dusk—thus causing great loss and inconvenience, and compelling the consumer to go and pay whatever the Corporation demanded; while, on the other hand, the "Stockport Advertiser" asserts that the cutting off took place in the morning. This, however, as we have already remarked, cannot affect the principle involved. If the Corporation had a legal right to cut off the supply at all, they were at liberty to choose their own hour for doing so. What was the exact nature of the "change of tenancy"? This seems to be the point on which the matter must turn. Needless to say, a "rule" of the Gas Department is not sufficient to justify such a step as was taken; and we feel sure the Corporation must have some other defence than this to offer to the charge which "Truth" has made against them. The sooner all the facts of the case are brought to light, the better it will be; for the word "blackmail" has an unpleasant sound, and we should like to see the Stockport Corporation prove conclusively that it cannot fairly be applied to them.

Municipal Electricity Supply at Newport (Mon.).

The remarks on the above subject which appeared in the "Electric Lighting Memoranda" in the "JOURNAL" for the 16th inst. appear to have excited a good deal of anger at Newport, and it has found expression in the series of editorial paragraphs in the "South Wales Daily Argus" which are reproduced in another column. Our criticism of the action of the Electricity Committee of the Corporation in deciding to sell current at less than cost price has evidently struck home, and is neither vitiated by the "argument" nor affected by the abuse of those who have tried to justify that action. We are accused of having "trickily succeeded in giving a misleading idea as to the difference between the cost of generation and the sale price;" and we are told that the 2·65d. per unit which we took, on the authority of the Office Manager's report, was the cost for the summer quarter, whereas the average for last year was 1·84d., while this year it is expected to work out to 1·75d. Our main point was that the power

consumers at 1d. per unit will get electricity at less than it will cost—that is to say, at less than the cost of generation and distribution, leaving out of consideration such insignificant matters as interest, sinking fund, and contingent expenses; and the circumstance that the Committee hope this year to bring the difference down to 0·75d. per unit does not alter the fact of which we complained, that one class of consumers will get an advantage over the others. Our contemporary—or rather those who speak through this medium—says the prices at which the Corporation could supply power were based upon what they expect to be able to do at their new station, when it is in proper working order. But we much question whether they will succeed in reducing the cost to between 1d. and 1¼d. per unit, as they anticipate. The action of the Committee is defended on the ground that the supply of current for power at 1d. per unit will have the effect of producing a day load with but little additional expense, and with no increase in the capital charges. We fail to see the force of this reasoning. It is well known that for several months in the year the day load has to be kept on during the hours of darkness; in fact, the consumer to whom reference was made in our previous comments was a "day and night" one—a 24-hour load. Now, the suppliers of electricity have to make due provision for the maximum hour's output; and, moreover, they have to do it without the aid of storage. How, then, can it be said that "the capital charges are the same"? It seems to us that they must increase in direct ratio to the peak load. It will be noticed that our contemporary has been good enough to offer some more or less pertinent observations as to the chief reasons for the existence of the "JOURNAL." We acknowledge that one is to protect, as far as lies in our power, important interests from the attacks of men who, in making them, resort to methods which they would not employ in conducting their own businesses. One such method is the sale of a product at less than its cost price; and when, as in the present case, that product is a competitor with the one with which the "JOURNAL" has for more than half a century been identified, we feel it to be our duty to condemn the practice as a bad example of municipal trading, wherever it may occur.

A Prediction at Halifax.

The affairs of the Halifax Corporation Gas Department have not during the last few weeks been exposed to the public gaze so frequently nor with such prominence as just previously; and apparently matters are at present in a state of repose. Whether any movement is being made behind the scenes, of course, we do not know. But, meanwhile, the gratifying announcement has been made at a mayoral banquet that there is "every probability" there "will be a very good profit indeed from the gas-works this year." The statement was made by Alderman G. H. Smith; and everybody hopes—the ratepayers especially—that the prediction will prove true. Of course, the ratepayers have still before them the fact that they lost money on the working last year; and they will be anxious now to learn the strength of the foundation on which Alderman Smith has just made his public announcement. Meanwhile, it may assist them to regard the gas undertaking a little more kindly to learn that, even after deducting last year's loss, it has contributed to the town £60,500 during the past ten years, which is about on a parity with the yield of the water undertaking—the two concerns having jointly produced £123,000 in the decade. These figures were advanced by the Alderman to prove that both works had been conducted with great benefit to the town, and that the gas undertaking was not "an example of municipal trading that was rotten to the core."

The Financial Irregularities at Hackney.

Some comments were recently made in these notes on the muddle in the finances of Hackney as revealed by a recent report of the District Auditor, whose criticisms included one upon an irregularity in the accounts of the Electric Lighting Department. The ratepayers called for an inquiry by the Local Government Board; and the Borough Council consented. The latter have since received a letter from the Board stating that they do not think they have jurisdiction to direct an inquiry as proposed; the allegations being primarily based on the report of various irregularities and defects due to causes arising before the Borough Council came into existence, and to the condition of former accounts, which were not subject to audit by a District Auditor.

WATER AFFAIRS.

The Principal Events of the Year.

IN commencing our review of the principal events (so far as this department of the "JOURNAL" is concerned) of the year which is fast drawing to a close, we do not think we shall be charged with using exaggerated language in qualifying it as one of the most memorable periods in the history of the water supply of this country. For something like three hundred years the Metropolis has been indebted to private enterprise for its water; for it was due to the ingenious Dutch engineer Norrys, towards the end of the sixteenth century, that this important service was taken up in anything like a systematic manner in the City of London, and to another private individual—Hugh Myddelton—that the first of the present Water Companies was established. The example set by the worthy "Citizen and Goldsmith" was followed, not many years afterwards, by other adventurers; and the undertakings initiated by them have ever since been carried on uninterruptedly by their successors. Now, for reasons which it is not necessary to discuss here, these great works are to pass out of the hands of those who have brought them to their present state of perfection, and be entrusted to a representative body, who, it is thought, will manage them more directly in the public interests than those who now control them have done. This remains to be seen. Our business, however, is not to speculate as to the future, but to briefly review the past.

After years of fruitless agitation and inquiry, an announcement was made by the Government a good many months ago of their intention to take up the Metropolitan Water Question; and accordingly a Bill embodying a scheme for the formation of a Water Board was introduced by the President of the Local Government Board on the 30th of January, and read the first time. It was expected that the measure would be based upon the recommendations of the Royal Commission presided over by Lord Llandaff; but it was found to differ materially from them, especially in regard to the constitution of the controlling authority. As introduced, the Bill satisfied nobody, and consequently it evoked hostile criticism on all sides. The Board proposed was considered to be unwieldy, the manner in which the Companies' property was to be taken away from them was unprecedented in the history of similar transactions, and the representation allotted to the London County Council aroused the indignation of that self-satisfied body. After an interval of about a month—during which time the President of the Local Government Board had been pretty freely attacked—what was most contemptuously called by a London evening paper his "miscegenous bantling" came before the House of Commons for second reading. A long debate took place on an amendment submitted by Mr. Buxton, to the effect that the Board proposed was "unsatisfactory and unworkable, "and repugnant to the general principles of municipal "government." But on the 3rd of March the Bill passed successfully the second stage; and, with the view of saving a double inquiry, it was referred to a Joint Committee of the two Houses. The Committee met for the first time on the 17th of April, under the presidency of Lord Balfour of Burleigh, the Secretary for Scotland; and they brought their investigation to a close at their twenty-third sitting, on the 13th of June. The most remarkable feature of the inquiry was the decision come to by the Committee to reduce the size of the Board, and afterwards, on a reconsideration of the matter, to retain the original scheme of membership. This extraordinary proceeding will be fresh in the recollection of those of our readers who followed the course of the inquiry. The Bill was duly reported to the House, and considered in Committee on the 11th of July, when Mr. Burns made an unsuccessful attempt to have the London County Council appointed the Water Authority. Eventually progress was reported on the 18th of July (a portion only of the first clause of the Bill having been disposed of), and then the House adjourned, leaving this and other measures for further consideration in an autumn session.

Parliament reassembled on the 16th of October; but, owing to the necessity for making progress with the Bill dealing with the subject of elementary education, the Water Bill was not taken up again until the 4th of December. The opponents of the measure were represented in the House by the Metropolitan members; but, apart from these, very

little interest was manifested in the matter. After two days' discussion, only four clauses had been disposed of. But Mr. Long had made certain concessions and had promised others; so that, by devoting the whole of another day to the work, the Committee stage was completed shortly after midnight on the 8th inst. The Bill was considered on report and read the third time on the following Wednesday, and forthwith passed up to the Lords, who were then holding a late sitting on the Education Bill. The second reading was taken on the 12th inst.; and though Lord Balfour and the measure he had in charge were subjected to some sharp criticism, this stage was safely passed. The Bill was considered on report the next Monday, when Viscount Hampden endeavoured to alter the constitution of the Board, so as to bring the number down to 33. As he was unsuccessful, Earl Carrington brought forward the proposal made by the London County Council for a Board of 43; but with no better fortune. Eventually the whole of the clauses and the schedules were got through, with drafting amendments. The Bill was again considered the following day, and further amendments made in it. At five o'clock it was read the third time and passed amid the cheers of the House. The Lords amendments were considered and approved by the Commons; and on the 18th inst. the Bill received the Royal Assent, and Parliament was prorogued. The passing of the Bill caused an undignified ebullition of temper in Spring Gardens, and a rise in the Water Companies' stocks in Capel Court.

Apart from the Government Bill, Parliament had not to consider any measure of very great magnitude in what may be called the session proper. Nevertheless, as our "Gleanings from the Committee Rooms" showed week by week, there was no dearth of interesting points. Two of the London Water Companies—the Grand Junction and the Kent—were granted further money powers; but the former were not allowed to extend their limits. In the Provinces, additional works were authorized in the cases of the Bristol, Newcastle and Gateshead, and other Water Companies; while in several instances the limits of supply were enlarged. A Company was incorporated for the supply of Ticehurst. The Weardale and Shildon Water-Works Company obtained power to purchase the undertaking of the Consett Water Company, who were given the necessary permission to considerably extend their works. Arrangements were sanctioned for the transfer of the Whitstable Water Company's undertaking to the Urban District Council, and one in the hands of a private firm at Cwm Avon to the Rural District Council of Neath. Among the schemes for which the sanction of Parliament was sought by Local Authorities, probably that of the Devonport Corporation, to acquire the undertaking of the Devonport Water Company, which is more than a hundred years old, was the most important. The Birmingham Corporation were granted an extension of the time specified in their Act of 1892 for the construction of certain works, as well as authority to make some changes in connection with their Welsh scheme; while the Swansea Corporation had an extra seven years in which to complete theirs, which were sanctioned at the same time. The Margate Corporation were authorized to carry out new works, for which a loan of £120,000 was permitted; and the Huddersfield Corporation had their unexercised power to construct the Butterley reservoir revived, and were permitted to make two others. Additional works are to be carried out at Buxton, Darley Dale, and elsewhere. The Liverpool Corporation were allowed to purchase land in the drainage area of the Rivington Water-Works, for the protection of the sources of supply. A Water Board was sanctioned for the Higham Ferrers and Rushden district. There were two noteworthy cases in which the powers applied for were not obtained by the parties. One of these—the most important—was the renewed application by the London County Council for authority to purchase the undertakings of the Water Companies; and the other was that of the Wolverhampton Corporation for power to construct additional works, and make further provision in regard to their water undertaking. The Council's Bill never got beyond the first reading, and was withdrawn; while the other was thrown out, after a protracted inquiry, owing to the powerful opposition of landowners and others. The Corporation struggled bravely against their opponents, but only to meet with the misfortune which had attended them in the preceding session. A Bill was introduced for the protection of underground sources of supply, but it was dropped.

Some interesting legal questions have arisen during the year. Towards the end of February, Mr. Justice Swinfen Eady had to grapple with the "domestic supply" difficulty in a case in which the Sunderland and South Shields Water Company had covenanted to supply a certain mansion and two farmhouses with water for "domestic and other purposes" free, on condition that they should be allowed to sink wells upon the estate. When, in course of time, the occupier sublet one of the outbuildings for a laundry, the Company very properly claimed payment for the water used therein, as being outside the terms of the covenant; and they were successful. The case of the amateur photographer who declined to pay the Stockport Corporation 10s. for water used by him came before the Lord Chief Justice and two colleagues, to determine whether or not this was a "domestic" use of water; but all they did was to refer it back to the Magistrates for them to state the full extent of the user. The Barnard Castle swimming-bath case came before the Court of Appeal, who quashed the judgment of Mr. Justice Buckley to the effect that the supply must be regarded as a domestic one. Their Lordships were, however, careful to point out that their decision must be taken as applicable only to the special circumstances under consideration, and that each case should be judged upon its merits. In a case which occurred at Chester, water supply to lock-up shops was classed as "domestic" service; while at Hawick a decision by the Sheriff Court that a public-house was not a "shop" was reversed on appeal.

The question of the right of a Corporation to charge differential rates was decided in the negative by Mr. Justice Bigham in connection with a dispute which arose at Northampton; and an appeal was decided upon. The proceedings evoked from his Lordship an opinion that a water "rate" must not be taken into consideration in making up the maximum amount of the general district rates in the added areas of a borough. The Tadcaster Rural District Council learnt by experience that they could not demand payment of water "rent" in advance, and then summon consumers for water "rates." The Huddersfield Corporation were involved in a dispute with eight mill occupiers as to their liability to supply compensation water; and a penalty of £5 a day for 43 days was imposed upon them in each case, at the West Riding Assizes, for failing to do so. A stay of execution was, however, granted to allow of an appeal. This came before the Supreme Court early this month, and it was dismissed with costs. It will now be taken up to the House of Lords. An extraordinary case was heard at the Lambeth County Court, in which the Kent Water Company resisted a claim for damages on the ground that the consumer or the householder had to make the connection with their mains, and consequently was liable for any personal injury sustained by a pedestrian through a defect. Judge Emden, however, held the Company liable; and it was intimated that the matter would go to a Superior Court.

The question of underground water rights has always been a troublesome one to deal with; and towards the close of the Trinity sittings Mr. Justice Farwell had to give a decision upon a phase of it on which there had never been a judicial pronouncement. The parties concerned were the Corporation of Bradford and other persons having rights in the water of a certain stream fed by a spring on the property of a landowner. This gentleman gave permission to a Local Authority to sink certain wells upon his land; and the effect was, as the plaintiffs alleged, to divert the waters flowing "in their well-defined underground channel." The defendants pleaded that the water did not flow in an "ascertained or a known channel." The question at issue was argued upon a point of law; and, in giving judgment, his Lordship dealt exhaustively with the whole matter. His conclusion was that, as no one could tell where or in whose land the stream in question ran, the defendants' plea must be upheld. Another case in which underground water was concerned came before Mr. Justice Joyce. There the plaintiff (a lady) had granted to the Sevenoaks Water Company permission, in consideration of the payment of £50, to construct an underground reservoir; and in carrying out their works they had tapped and utilized certain springs. This, it was contended, they had no right to do; and the statement of claim set up a charge of fraud against them. But the learned Judge pointed out that their proceedings were sanctioned by the language of the deed signed by the parties, the full effect of which was evidently not appreciated by the plaintiff. His Lordship dismissed the action; and

the Company did not ask for costs. Closely allied to the question of underground water is that of its divination. The "dowser" may be possessed of some extraordinary power which enables him to see farther beneath the surface of the earth than most of his fellow-creatures, but it behoves him not to place too much confidence in it. Two cases have occurred during the year in which the same diviner's predictions were not fulfilled, with the result that his clients obtained damages against him, from which, in the earlier of the cases, he failed to obtain relief in the High Court. In the other the attempt has not yet been made.

The question of the amount of compensation to be paid to a colliery company for mineral left in the workings in order to support a reservoir, was the subject of a considered judgment by Mr. Justice Swinfen Eady in a case arising in connection with an arbitration between the Wigan Corporation and the Wigan Cannel Colliery Company, Limited. His Lordship decided that the Company must be paid for all the coal left in the ground. Pressure upon the surface of the earth in another form was the subject of litigation. In this case the Colne Valley Water Company recovered compensation from the owner of a traction-engine for damage done to their mains at Bushey and Stanmore. The support given by a Divisional Court to the contention of the New River Company, that the increased assessment imposed by the Assessment Committee of the Hertfordshire Union was unjustifiable, was withdrawn by a unanimous decision of the Court of Appeal. An interesting case arising out of the supply of water by meter arose at Southampton, and subsequently came before the High Court. It turned on the limit of time within which unpaid water-rents could be recovered; and their Lordships upheld the decision of the local Bench that it was within six months from the date of application for the money. In a case in which the New River Company were concerned, the Judge at the Clerkenwell County Court laid it down that where a person, not liable in law, continuously paid water-rates, and so became recognized as the right party to pay them, he could not repudiate responsibility without giving the Company notice. Being of a *quasi*-legal character, it may be convenient to mention here that arbitration proceedings have been reported during the year in connection with the water undertakings supplying Airdrie and Coatbridge, Caton, Cromer, Exmouth, Llandrindod Wells, North Pembrokeshire, and North Warwickshire; also assessment appeals by the East London and Grand Junction Water Companies.

The year has witnessed a satisfactory advance in the direction of improving existing works for the supply of water, or providing them where they did not exist. The great scheme of the Birmingham Corporation for bringing water from Wales has made excellent progress, though its completion has been somewhat delayed. It is, however, sufficiently near to justify the Corporation in appointing a Resident Engineer to take the supervision of the whole of the works, and be responsible for the delivery of water into the city. Pending this event, the Committee are hopeful of being able, with the auxiliary supply of half a million gallons of water they receive daily from the East Worcestershire Company, to meet all requirements. The Corporation of Glasgow have made provision for increasing the supply to the city by the utilization of the water of Loch Arklet, and by altering the position of the dam sanctioned by their Act of 1885. With a similar object, the Liverpool Corporation unanimously sanctioned early in the year the laying of a second line of pipe from Vyrnwy; and the Manchester Corporation made arrangements for expediting the work in connection with the duplication of the Thirlmere pipe-line. New works or extensions were completed in the course of the year for Bewdley, Bradford (Nidd scheme), Church Stretton, Frome, Goole, Lancaster (the Blea Tarn reservoir), Leeds, Madeley and Broseley, Newport (Isle of Wight), Swindon, Rawmarsh, and Ripponden; while others were commenced or projected for Cardiff, Chelmsford, Devonport, Honiton, Kidderminster, Leeds (Ure Valley scheme), Leeswood, Margate, Nottingham, Oldham, Otley, Peterborough, Rothwell, Torquay, and elsewhere. Having had some trouble with the "engineering" of their Geltsdale scheme, the Corporation of Carlisle have sought the advice of Mr. James Mansergh, F.R.S., on the subject. An event worthy of record here is the publication early in the year of an account of the boring operations being carried out at Boultham with the object of securing for Lincoln a never-failing supply of water of high quality. This is the largest boring for water-works purposes ever driven—the total depth from the surface being some 2200 feet; and it is being carried out under the supervision of Mr. Percy Griffith, M.Inst.C.E., the Consulting Engineer to the Corporation, and Mr. J. H. Teague, the Water-Works Manager. In the Metropolis, the scheme for connecting the distributing systems of the Companies, which has been for some time in progress, has now been practically carried out.

The year has not been altogether barren of negotiations for, or the completion of, purchases of water undertakings. The Urban District Council of Shepton Mallet made an offer to the Water Company for their works; and the similar body at Worksop decided to purchase. Negotiations commenced at Sevenoaks were, however, abortive; the offer of the Urban District Council of £86,610 for the undertaking being declined by the Water Company. In contrast to the desire to acquire the control of the water supply may be placed the decision of the Caerphilly District Council to relinquish it, and hand it over to the Rhymney and Aber Valleys Gas and Water Company, who, doubtless, will give much more satisfaction to water consumers than their predecessors did. An interesting case of rivalry between a Water Company and a Local Authority occurred early in the year in Kent; the Hollingbourne District Council having applied to the Local Government Board for a loan of £10,000 for providing a water supply for certain places included in a scheme for which sanction had been sought by the Mid-Kent Water Company. In the result, however, the parties came to an agreement, and the Company's application was unopposed. Kent has also been the scene of movement having for its object the formation of a Water Board to control the water supply of a portion of the county. The Southport Water Company passed out of existence early in the year.

Happily, there are not any very serious accidents to record in connection with water undertakings. A fatal one, however, occurred at the works in progress on Matlock Moor for the Matlock Urban District Council, where a landslip buried two of the workmen, one of whom unfortunately died from the effects. A serious case of lead poisoning occurred at Shelf, which is supplied with water purchased from the Bradford Corporation; but analysis showed that the water was remarkably pure and soft. It was therefore concluded that the lead service-pipes were at fault. Lead poisoning also occurred at Dukinfield. The year had not been many hours old when a burst occurred in a 40-inch main belonging to the Manchester Corporation; but it did not cause any interference with the water supply of the city, as it was only a feeder to the storage reservoirs. Another burst took place later in the year; and within only a few days of it the Liverpool Corporation had a similar misfortune with a 44-inch pipe. The steam-roller and the traction-engine proved as unfriendly as usual to the mains over which they passed; the former fracturing a 7-inch main at Swansea, in addition to breaking a gas-main and causing an explosion. The traction-engine was put to strange use in connection with water-pipes by the Surveyor of Highways to the Eton Rural District Council; inasmuch as by its aid he forcibly dragged from the ground pipes which had been laid by the Rickmansworth Water Company. A large reservoir at Harrogate was found to be in a rather serious condition; and the Upper Neuadd Reservoir of the Methyr District Council sustained damage to the diaphragm plates—whether caused by lightning or dynamite is not certain.

The technical literature of water supply has been considerably enriched this year. On the resumption of the meetings of the Society of Arts after the Christmas recess, Dr. Samuel Rideal delivered a series of four Cantor Lectures on the "Purification and Sterilization of Water," in the course of which he brought before his audience a number of highly interesting matters. The British Association of Water-Works Engineers had an excellent meeting at Leicester in July, under the presidency of Mr. Frederick Griffith, M.Inst.C.E., the Water Engineer to the Corporation. There was a numerous addition to the roll of the Association, both of members and associates; and the subjects dealt with in the papers—especially that of the standardization of water-fittings—were all of considerable value. The winter meeting, held early this month, was equally profitable. The membership of the Association was still further increased; and the presidency was conferred upon Mr. R. H. Swindlehurst, of Bolton—Mr. F. J. Bancroft, of Hull, being the Senior Vice-President. The Society of

Engineers, who had for President this year Mr. Percy Griffith, M.Inst.C.E., F.G.S., the Secretary of the Association just referred to, did much good work, and paid several visits—one of special interest to water engineers being to the Southampton Water-Works. It will not be out of place to mention here the publication by Mr. Griffith of a useful book entitled "Water-Works Law as Applied to Small Undertakings," in which he conveys to the reader, in simple, colloquial language, a number of valuable particulars collected from various Acts of Parliament and obtained from personal experience. The scheme of the Belfast Corporation for bringing a supply of water to the city from the Mourne Mountains was described in a paper read by Mr. John L. Macassey to the Belfast Natural History and Philosophical Society. Papers more or less closely connected with water supply were read at the meetings of the Institution of Civil Engineers, the Royal Institute of Public Health, and the Sanitary Institute.

The movement initiated by the British Association of Water-Works Engineers, and supported by the Sanitary Institute and the County Councils Association, for the establishment of some authority for the control of underground sources of water supply, has been kept alive; and the importance of the subject was pressed upon the President of the Local Government Board by an influential deputation who waited upon him towards the end of October. It was scarcely expected that he would make any definite promise of assistance, especially in view of the fact that a Royal Commission is sitting whose investigations embrace matters which it was suggested should be entrusted to the proposed separate authority. At the same time, Mr. Long expressed his sympathy with the objects of the deputation, and promised to give careful attention to the points raised. In the course of his reply to the various speakers, he quoted the opinion of the Commission in question to the effect that a separate body, or a new department of the Local Government Board, should be created, who should have supreme control over rivers, and take steps for their purification where local authorities failed to do so. A Bill having for its object the improvement of the law in this respect was introduced early in the session by Sir Francis Powell; but it had to be dropped. The proposal to constitute a Rivers Board suggests allusion here to the fact that the idea enunciated some time ago by Dr. Percy Frankland, that a Minister of Public Health, having Cabinet rank, should be created, is gaining supporters. From the control of watershed areas, it is an easy transition to their utilization; and therefore it may be mentioned that the advisability of afforesting their gathering-grounds was forcibly brought before the Water Committee of the Halifax Corporation early in the year. In this connection, it may be interesting to record that the Water Committee of the Birmingham Corporation have decided to afforest the Elan Valley, commencing with 75 acres—one reason assigned being that it will promote the rainfall. But though last summer was not a "droughty" one—the year, in fact, opened with rivers in flood—scarcity of water was experienced in several counties. Anxiety was prevalent in Manchester, but it was relieved by the October rains. Essex appears to have been the greatest sufferer; the wells in no less than seven parishes having dried up. This is the seventh year of a gradual decline in the rainfall; and the condition of the county has not been so bad for twenty years. Trial borings are to be made; but it is reported that the water in the chalk basin has gone down 30 feet. In the Metropolis, however, as one of the daily papers had the justice to testify, the supply was constant and ample.

There are only a few personal matters to notice in concluding this "abstract and brief chronicle" of the events of the now fast-dying year. Beginning with the Metropolis, it is pleasant to record the recognition by the East London Water Company of the eminent services rendered by Mr. I. A. Crookenden, the Secretary, by paying him a substantial sum as an *honorarium*, and making provision for his retirement. The Chairman of the West Middlesex Water Company and of the Staines Reservoirs Joint Committee (Mr. E. Boulnois, M.P.) received from the Borough Council of Marylebone testimony of their appreciation of his services as Mayor for two years. The Engineer of the Company (Mr. M. Wilson Hervey, M.Inst.C.E.) relinquished his position and was succeeded by Mr. H. Fillmer Rutter, Assoc.M.Inst.C.E., one of the Assistant-Engineers. Mr. F. W. Macaulay was appointed Resident Engineer of the Elan Valley scheme of the Birmingham Corporation. Within a few weeks of the close of the year, Mr. J. M. Gale sent in his resignation of the position of Chief Water Engineer to the Glasgow Corporation, after 43 years of faithful and efficient service.

Underground Pollution.

The question of the pollution of water supplies is one in which water engineers have a perennial interest; and therefore it is not a matter for surprise that it has frequently enjoyed the attention of the members of the British Association of Water-Works Engineers. The subject was brought forward in a paper by Mr. William Matthews in 1900; again, more particularly in regard to moorland gathering-grounds, by Mr. William Watts in 1901; and at the recent winter meeting, Mr. John Shaw rounded off the general subject by dealing exclusively with the pollution of underground waters. We cannot say, however, that this paper has appreciably added to the stock of knowledge on the subject. nor that the text justifies the title of "The Detection and Prevention of Underground Pollution." There is little in the communication which informs the water engineer on the first important point of how to detect underground water pollution, beyond suggesting analyses and having recourse to the bacteriologist; That was well known before; and in regard to the "prevention' of pollution the paper is likewise destitute of freshness. We are afraid that the reason the text of the paper does not reach the level anticipated, both from the title and the well-known *penchant* of the author for penetrating matters below the surface, is that it was written (we believe by request) before Mr. Shaw was fully prepared for the task. It transpired in the discussion that he is carrying out some experiments on the subject, and that these are not yet in a sufficiently complete state for the submission of the results to the members. Therefore the present paper, it may be taken, is merely preliminary to something which will transcend it in instructive quality. For the supplementary paper, we shall look with pleasure.

The "Curious Natural Law" of Water Divination.

The profession of water diviner, as was demonstrated by a legal case early this year and another a few weeks ago, has, like other professions, its responsibilities as well as its fees. The definite statement that water will be found at a certain spot and at a given depth, brings the diviner within reach of the law, should damage arise through its not being so found. It would thus appear that the diviner's safeguard is to fall back upon a more or less vague opinion—"I think" or "I believe." But then the question is, Would anyone be found willing to go to the expense of sinking a well, if the diviner himself had not perfect faith in his own powers, and did not give evidence of this faith by definitely asserting that the water would be found? We think not Then, again, if the matter depends upon a "natural law," as was contended in the case which is reported in the "JOURNAL" to-day, no such "hedging" as is hinted at above should be at all necessary. But be this as it may, Mr. (or, as he is said to designate himself, "Professor") Child has been involved within about a twelvemonth in two cases, owing to the alleged failure of his "animal magnetism" to "locate the spot" (*vide* report) and the depth at which water would be found. Both cases he has lost; and the first of them he unsuccessfully took to the High Court. In the one to which we now refer, the Jury found that Mr. Child stated where and at what depth water would be found, and that he did this "at hazard, but not recklessly." There may be an appreciable difference in the meaning of the two words in this connection; but anyway the verdict does little to vindicate the "science" of water divination as practised by Mr. Child. The Counsel for this gentleman said, during the hearing, that the matter was governed by a "curious natural law, which *even* Mr. Child could not explain." How hopeless must it be, then, for ordinary mortals like ourselves to attempt to solve the mystery! The £10 damages awarded by the Jury can hardly be called very extravagant, seeing that over £200 was spent on sinking a well which, owing to the great depth at which water was met with, is said to be practically useless. A stay of execution was granted, so that possibly this case too may in due course make its appearance in the High Court.

ESSAYS AND REVIEWS.

THE HONORARY MEMBERSHIP OF THE NEW INSTITUTION.

Of all questions in which the members of the commercial section of the gas industry are for the moment interested, that of their future association with the new Institution is perhaps of paramount importance. The Council have found they have a difficult problem to deal with; and in its solution we venture to think that, in the multitude of interested counsellors, they will not find wisdom. In this category, the writer of the subjoined letter cannot be included.

Sir,—About ten days ago, Mr. Helps wrote to ask whether it was by inadvertence that I had not applied for membership of the new Institution; and my reply was that I had hesitated because I was not certain what the united Councils would do in regard to the admission of traders to honorary membership—in short, what practical interpretation they would give to Mr. Jones's remark at the Institution meeting in last May, not to "make it too limited or narrow." To that remark, I take no exception, provided it is interpreted as Mr. Jones by the context clearly intended. I have since heard that there is a feeling in the Council that the matter should be dealt with in "a very broad and liberal spirit;" and I have also heard that many names are proposed for inclusion in the list to be submitted to ballot for honorary membership. To include a name in the balloting-list is a token that the Council think the bearer of it eligible; and it will go a long way to ensure his election.

"A very broad and liberal spirit" has, as a phrase, a very nice sound; but it cannot be generally applied to principles or to dealing with the rights and property of others. It would no doubt be very liberal to admit the whole body of traders as honorary members; and I really do not see how any can be excluded if one is admitted in violation of the rule that governs admission to the Roll of Honour—viz., that he "has rendered distinguished services to the profession of gas engineers, or who has specially promoted the interests of the gas industry." There is no room for very broad and liberal spirit here. To thus violate the rule would degrade the Roll of Honour and the Institution at the same time. Moreover the effect would be very far-reaching; for honorary membership would cease to be an honour and the future Perkin or Siemens or Welsbach could hardly be asked to accept it, and if asked would probably decline. No; if the new Institution is to be worthy of respect, it must most carefully guard the honorary membership. I sincerely hope I may be mistaken as to the way in which the united Council will deal with this matter; but if they act in the way I have some reason to fear, I am doubtful whether the union will be as complete as we have all been hoping.

Not being at present—although hoping to become—a member, I have hardly the right to discuss the question; but my views, even if sound, must only be taken for what they are worth. I therefore venture to leave generalities and take particular cases simply as illustrations. I mean no disrespect to traders, for I have had every reason to regard the great body dealing with gas companies with every feeling of respect. I only think them out of place as members of the Institution of Gas Engineers unless they come within the rule above quoted. The two Past-Presidents, Messrs. Hepworth and West, as such, have rendered "distinguished services to the profession;" and the latter has certainly "specially promoted the interests of the gas industry" by the invention and development of his stoking machinery. Among other traders, Mr. Fletcher may be mentioned as one who, by his scientific investigations, and his many practical applications of the use of gas for heating purposes, "has specially promoted the interests of the gas industry." But where is his fellow among the stove makers? They have done good and useful work; but can it be said that they come within the rule? If another is admitted, how can any one of them be excluded? Then there is Mr. Sugg, who is already very deservedly and appropriately an Honorary Member; his early and continuous work with gas-burners, among other services, having "specially promoted the interests of the gas industry." I venture to mention another name in connection with gas-burners, Mr. George Bray, who has rendered a similar special service. It is also due to him that the present union has become possible—the magnanimity of his voluntary offer to retire from the Institute when two or three years ago he said at their meeting: "It is yours to command; it is mine to obey." This ought not to be forgotten.

Then there are members of the old Institute who may not be exactly qualified for membership, but whom all would be sorry to lose. Alderman Miles, of Bolton, who has been for years an Ordinary Member, and is, it may be, now disqualified under the rules of the new Institution as being Chairman of Meters Limited. I say "may be," because I hope the contrary; and I may remark that, if he is disqualified as Chairman of a trading Company, are not Directors of such Companies dealing in gas materials equally disqualified? To act rigidly on this doctrine would go much further than anyone wishes, and would exclude men whom all desire to retain.

Fortunately, there is a way out of the difficulty provided by Rule 4: "No person shall be qualified to become a member . . . who *in the opinion of the Council* [the italics are mine] is actively engaged in or about the management or business . . of a joint-stock company, &c., doing business with gas undertakings." This leaves it to the Council, who are, as it were, a jury to find the facts, and give a verdict which, even if a point should be strained here or there, would be cheerfully and loyally accepted.

I should like to illustrate the point by one more case; and here again it is an old member of the Institute, whom all wish to retain. I refer to Mr. T. Duxbury, who was for many years a member by right of being Engineer and Manager of the Darwen Gas-Works. He is now in trade; but cannot his years of membership as an Engineer have some weight in the consideration of his eligibility as an Ordinary Member? But putting that aside, does not Mr. Duxbury's successful resistance to the strike of the Gas Workers' Union, and the manner in which, after it was over, he dealt with some of the returned strikers who attempted to injure his loyal men, entitle him to come in as an Honorary Member for having "specially promoted the interests of the gas industry"? It happened at about the same time as the disaster at Leeds (which restored to the Union much of the power and prestige they lost in Manchester and London), and in a sense retrieved that disaster, and thus greatly benefited the gas industry by curbing the power of the Gas Workers' Union.

I have said enough—perhaps more than enough; but without doing violence to the rule relating to honorary membership, it is clear that the small number of trading members whom it is either desirable to have or whom it would be hard or unfair to exclude can be admitted without breaking the rules or giving offence to anyone.

I hope those concerned will take this letter in the spirit in which it has been written, which is simply a desire that the new Institution may start on its great career with the goodwill, the hearty support, and the thorough friendship and loyalty of all its members, and thus crown the work of the two Councils as it richly deserves.

Dec. 26, 1902. George Livesey.

P.S.—The above was written on the assumption that the original rules stood as set forth on p. 1000 of the "Journal" for Oct. 14 last; but it has since been pointed out to me that the rule as to honorary membership has been radically altered (see "Journal" for Dec. 2, p. 1459). The position of honorary member by this alteration absolutely ceases to have any honour attached to it; and this is a great departure from both the spirit and the letter of the resolution which was unanimously passed by the Institution in May last, as set forth on p. 999 of the "Journal" for Oct. 14.—G. L.

ELECTRIC LIGHTING MEMORANDA.

A Retrospect of 1902.

The progress of the electrical industries during the past year has been of an industrial rather than of a scientific or technical kind. It has been very considerable in amount. Almost every electric lighting undertaking in the kingdom claims large additions to the number of lamps in circuit; and the popularity of electric tramways is unmistakeable. Many years ago it was argued in these columns that if electricians could only obtain possession of the traction field, they would find in it a volume of business beside which their interest in lighting would sink into insignificance. Experience seems to be justifying this expectation; for electric trams are as popular, and desirable, and cheap, as electric light is dear, and troublesome, and the luxury of the few. No real advance has been registered during the year in the substitution of electricity for steam in the working of full-sized railways, although it was understood that arrangements to this end were begun. Quite early in the year it was reported that a couple of powerful American financiers, backed by any amount of money, were ready to electricize the London underground railways, and to supplement them with a network of tubes and trams; but the end did not justify the proceedings. The partners, or rivals, or whatever they were, fell out while the schemes were passing through Parliament; and apparently London will have to wait for the benefit of the American invasion.

Sufficient progress was made with electric tramways during the year to show that where population is sufficiently thick to maintain them, they can entice away all the paying traffic from the ordinary suburban railways. One train an hour, and dear and dirty at that, cannot stand against a cheap fast tram service every few minutes. How the competition will work out within the next few years cannot be foretold; but the last year or two has certainly seen the commencement of a greater revolution in road and rail transport methods than has appeared since the introduction of steam locomotion. In some provincial centres, the electric tramways took over the whole electric lighting service; but, to say the least, the finance of this arrangement is doubtful. Several municipal electricity supply undertakings overbuilt themselves, with the result that they have a lot of superfluous plant, for which they seek to find work by offering electric power to the public at

less than cost price. Even so, the demand for distributed electric power is growing very slowly. It means a large outlay for motors and accessories, with no guarantee that the supplying authority will not suddenly put up the price of the unit to a prohibitive figure. On the other hand, electric power distribution in factories is becoming very fashionable, and when the prime mover is a gas-engine, it is not unduly expensive.

In the department of lighting, the year has seen the commercial introduction of the Nernst lamp and the Bremer flaming arc lamp. The latter, with its golden-coloured light, is a very showy article. The Westinghouse building in the Strand, when lit up by a lofty line of these lamps, is a fine sight this winter. The Nernst lamp is reported to run on one-half of the current per candle power of the ordinary vacuum lamp; but as it is of three or four times the brilliancy of the latter, as ordinarily employed, there is no actual saving by its use. It is more on an equality with the Welsbach gas-burner, in point of lighting power; but, of course, it must be very much more expensive. The long-promised osmium lamp has not appeared. The central station lighting interest has suffered in reputation from its enforced adoption of high-voltage services. This has gone on everywhere, with the result that the consumer has to pay about one-third more for both light and lamps than he did in the days of the 100-volt supplies. The Americans declare that nothing will induce them to go to the higher voltage, which they contend is only a stop-gap expedient of the supply companies, to save them for the time being from enlarging their mains, at the consumers' expense. What will they do when the mains get too small again? It will be quite impossible to raise the voltage further. A "No Thoroughfare" stares undertakers of electric lighting in the face; and they will learn that they have put their customers to unnecessary expense, and played into the hands of the gas companies, to no permanent good.

The earning of real profits from electric lighting has proved to be no easy matter, in the experience of the many local authorities whose finances in this respect are in unstable equilibrium. A few London Companies are making good money; but not all. The local authorities throughout the country who are really solvent on their electric lighting ventures, might be told off on one's fingers. Others flatter their public that they are making both ends meet; but inasmuch as they usually have no reserve funds, and no allowance for depreciation, they are only deceiving themselves. What they fondly regard as profits, are drafts upon capital which will have to be met later on. Time will prove which is the right side in this contention. The difficulty of the consumer's fittings, and after that of the consumer's meter, has proved a considerable hindrance to the prosperity of electric light undertakings in all but the wealthiest quarters. Free-wiring systems, so called, have not improved their reputation during the year, but, on the contrary, have led into many kinds of trouble those who patronized them. Consequently, the ordinary householder, who might take to electric lighting if he could have it laid on gratis or at a cheap rate, is reduced to the condition of longing for what he cannot obtain upon suitable terms; while the supplying authority, who would gladly have him for a customer, are constrained to pass him by. The Local Government Board will not sanction loans of money to be expended on the free fitting of consumers' premises.

Electricity meters continue to play vexatious pranks; and a Borough Electrical Engineer, at Taunton, who was alleged to practice a short and easy way of correcting the indication of these machines, by merely charging consumers what he thought they ought to pay, was proceeded against by criminal process for his asserted misdemeanour. Of course, he was acquitted; but the incident is instructive. Again, in the City of London, a consumer of electricity successfully resisted a charge based upon the registration of a meter. Persistent endeavours have been made in different localities to apportion consumers' charges to their relationship to the supplying concern, whether as profitable customers or otherwise. From this has sprung an astonishing variety and complexity of prices, for the honesty of which the public have to depend entirely upon the suppliers, because the consumer can never tell what his bill is likely to be. On the top of this, as though the business of electricity supply were not sufficiently complicated, in several districts electric power is offered at considerably less than it costs to produce.

Electricity-in-bulk generating schemes have begun to do business during the year; but with what chance of realizing the expectations formed of the idea remains to be ascertained. The incompatability of municipal trading in electricity with company enterprise in the same commodity, has been further recognized, irrespective of the Electric Lighting Act. 1882, which admits competition without distinction between undertakers. A heavy arbitration was accordingly held, to determine what price the Borough Council of Marylebone should pay for the portion of the undertaking of the Metropolitan Company within their limits. In the City of London, competition was effectively carried on between two Companies; but in South London the struggle for what little electric lighting was to be done did not prove very profitable, and the Companies concerned vainly tried to get rid of their properties to the Local Authorities. In the case of the Bermondsey Order, the precedent was established that municipal electricity ventures should be self-sustaining.

Electrolytic industries have not been increased in number during the year. Works for the production of calcium carbide had been overbuilt, and there was a heavy depression in the trade in consequence, which lasted the whole of the year. It is now reported that this industry is reviving; while electrolytic processes are taking a larger part in the every-day work of the manufacturing chemist. Still, there is a great deal yet to be accomplished in filling up the gap between methods and processes, nowhere so wide as where electricity is of the essence of the proceedings. The trade in accumulators has been steady, and there was a distinct revival of the fashion of electric traction by this means—the first sign of life of the kind since the "electric-cab" collapse. This time, the electric cabs and carriages put upon the streets have been exclusively private property, and not hackney coaches; and they appear to show a great improvement on the older accumulator-driven vehicles.

Generally speaking, therefore, the various electrical industries have grown and thriven fairly well during the year, which state of things can only be regarded as disappointing by those who believed that the advent of electricity was competent to drive everything else before it.

THE PENDING CRISIS IN THE SOUTH WALES COALFIELDS.

After dragging on for a couple of months without coming to any definite result, the negotiations between the representatives of coal owners and miners in South Wales over the system of determining rates of wages that is to be adopted as from the end of this year, have rather unexpectedly reached a critical point; and those who up to the present have been prophesying a peaceful settlement are expressing considerable alarm at the latest developments. The negotiations have ambled along in, to use a homely phrase, such a "wobbly" manner that it has been, and is, extremely difficult to form an opinion as to what is exactly the policy of either party, or what the upshot of it all will be. But as the meeting to be held to-day may be fraught with serious issues for the coal trade, we will briefly explain the course of the negotiations and their present position.

It will be remembered that the sliding-scale for determining rates of wages, by adjusting them to the ascertained average selling price of coal, comes to an end on the 31st inst., by virtue of the notice given by the miners six months ago. When the South Wales Federation joined the Miners' Federation of Great Britain in 1898, they agreed that they would terminate the sliding-scale agreement with the coalowners at the earliest possible date, in order to fall in with the general policy of the larger Federation. Accordingly, their representatives gave the necessary notices in July last; and they have since put forward, as a suggested substitute for the scale, a policy of determining wages by means of a Conciliation Board presided over by an independent Chairman, with this limitation upon its proceedings—that wages should not fall below 40 per cent., nor rise to more than 70 per cent., above the standard (1879) rates. The latest bi-monthly audit, it may be mentioned, gave the men an increase of $1\frac{1}{4}$ per cent. (due to the sales on American account) making the current rates $48\frac{1}{4}$ per cent. above standard. But it is common knowledge that such a figure is far beyond the average; the percentage over standard having only exceeded 20 per cent. in eight out of the past twenty-three years. In 1887, the rate fell to only $2\frac{1}{2}$ per cent., and in 1897 to 10 per cent. above standard. Last year—when conditions were altogether abnormal—was the first in which it exceeded the proposed maximum of 70 per cent.

When the negotiations were formally opened on the 4th ult., the men's proposals were discussed, and the meeting was adjourned for eleven days. In the meantime, the owners decided to give notices terminating all hiring contracts on Dec. 31. They were advised to do this because of what is known as the "small coal" difficulty. This question may form one of the principal bones of contention if a stoppage of work occurs; so we must give a word of explanation. Under the sliding-scale, the men are only paid for the "large" coal they mine—"large" being such as does not pass through the "Billy Fairplay." The rate paid for the "large" is sufficient to remunerate the men for all the coal mined; and the system of payment is designed to make them less wasteful in working. Apart, however, from the sliding-scale agreement, it has been confidently held in some quarters that the men are legally entitled to payment for "small" as well as "large." The owners were, therefore, not disposed to continue work beyond the period of the agreement without a guarantee that the question of payment for "small" would not be raised by individual men. At the adjourned meeting, the employers agreed not to give notice on the 1st of December, in consideration of both parties undertaking that, if no new agreement has been made by the end of the year, conditions as to wages and small coal payment are to continue unaltered until either such agreement has been signed, or the negotiations have been broken off. In the latter event, work is not to cease until the end of the month following that in which the negotiations terminate.

Then followed another adjournment for ten days, and then a meeting at which the owners' representatives put forward a proposal that the present sliding-scale should be continued until the end of next year, and that, to comply with the letter of the law,

small coal should be paid for at one-tenth of a penny per ton. The avowed motive of the owners in suggesting a postponement of the negotiations for a year was that, at the Southport conference, the Miners' Federation of Great Britain recommended its various branches not to make any wages settlements extending beyond 1903 (in order that, at the end of that year, a general movement could be started for a higher minimum rate of wages), and the owners thought it unnecessary to make new arrangements for one year only. The fact that, at the end of another year, wages under the sliding-scale would certainly be far below the present rates—and the conditions for negotiating a minimum wage consequently more favourable—was doubtless not absent from the minds of the owners. It certainly was present in the minds of the men, when, on the 5th inst., they announced formally that they could not assent to the proposed extension of the expiring agreement. They also declined to agree to the proposed settlement of the "small coal" question. The leisurely negotiations were then adjourned until the 15th inst., when the men brought forward further proposals, which the owners countered with a demand that has stirred the sluggish waters into something approaching a storm.

The men made two propositions, one being identical with their original proposal, with the important exception that they made no suggestion as to what should be the minimum and maximum rates that the Conciliation Board might grant—practically an admission that their first proposal was out of the question. Their alternative proposition was that the wages rate in South Wales during 1903 should follow that awarded by the Conciliation Board for the Federated districts of Great Britain during that year. The owners replied that they had no opposition to offer to the principle of a Conciliation Board or to a minimum wages rate, provided there was a maximum rate also. The sliding-scale has, therefore, contrary to expectation, been abandoned by the owners. But they proceeded to attach to the abandonment certain conditions, which also proved very decidedly contrary to expectation. The first, and by far the most important, is, that there shall be a "substantial" reduction of wages forthwith; the second is that the "small coal" question shall remain as it stands for a year, unless the men accept the nominal rate of one-tenth of a penny per ton; and the third, that the colliers shall pay a higher price for their house-coal, which at present they get for considerably less than cost price.

These proposals came like a thunderbolt upon the men, who have throughout shown signs of expecting to get matters almost entirely their own way; and the most optimistic observers of the situation are expressing serious doubt as to whether the crisis will end in a peaceful settlement, especially in view of the spirit in which the men have received the proposals of the employers. Considering the rates of wages now being paid in other coalfields, the certainty of a fall in prices in the near future, and the desirability of not having to re-open the wages question immediately the Conciliation Board is brought into existence, the owners are certainly right in requiring a material reduction in wages as a condition precedent to their dropping the sliding-scale. It is to be hoped most sincerely that the catastrophe of another strike in Wales may be avoided—and the Taff Vale judgment, coupled with the possibility of an adverse decision in the "stop-day" litigation, may well give the Welsh Federation pause. But the omens at present are certainly not favourable; and we have, therefore, thought it advisable to inform our readers of the position of affairs.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1763.)

Business on the Stock Exchange is always carried on under difficulties in Christmas week; and this year it was as bad as ever—the week being cut in half by the two-day break. But there was one good thing about it, and that was the continued cheerfulness and buoyant tendency of practically every department. In the Gas Market, the aggregate of business done was extremely small, and very few stocks in the list were touched; but prices in general, where there was any indication at all, were firm and rather inclined to advance. However, there was no actual change; and, probably for the first time in our record, there was not a single alteration in any quotation, either of Gas or of Water, so far as the London Stock Exchange is concerned. One change in the Provinces relieves the record from being an absolute blank. In Gaslight issues, on only one day of the week were there any transactions in the ordinary; and they were just at the middle prices. One or two deals took place in the secured issues; but they were scarcely so good. South Metropolitan, strange to say, was really quite active, and the prices realized were good; the stock changing hands repeatedly at 118½, which was the closing mark. There was nothing done in Commercials. The Suburban and Provincial group had the distinction of furnishing the solitary example of a change in quotation; Liverpool "A" advancing a point on the local Exchange. A few transactions in the Continental Companies showed that European and Imperial were inclined to be firm; but Union changed hands at a poor figure. The remoter undertakings were not at all in evidence. Business in Water was at the lowest ebb of quietude; and there was no change made in any of the quotations.

NOTABLE EXPERIENCES WITH BLUE WATER GAS AT ILFORD.

Second among the gas-works in this country to set the Dellwik-Fleischer water-gas process in operation were those of the Ilford Gas Company; and in its application there, it has had the advantage of that energetic personal attention that has characterized and made so prosperous the doings of Mr. J. H. Brown during the five years that he has been the Engineer of the Company. It was only in May last that the plant was put to work; and he leaves it to-day as one of the most successful of the portions of the equipment of the works that have risen on his initiative. Speaking (if we may) for the gas profession at large, although perhaps it savours rather of selfishness to say it, it is a little matter of regret that Mr. Brown's transition to a higher sphere of duty will prevent him continuing his investigations into this fascinating subject of the use of blue water gas in conjunction with ordinary coal-gas manufacture, and giving to the gas profession the results over a complete period. However, Mr. Brown has courteously permitted us to inspect the system he has adopted in applying the water gas and the working records up to (within a day or two) the date when his official connection with the Ilford Gas-Works ceased. Although we cannot hope to give as much interesting detail here in this account of a brief investigation into the working as one who has had an intimate daily association with the operation of the plant, the figures which we have extracted from his register of the daily make of gas, and the other information, will, it is believed, prove of considerable interest. They form a notable addition to the (so far as actual work in this country is concerned) scant information possessed in this particular direction. Evidence culled from daily working over several months will do much in enabling this method of utilizing water gas to assert its claim to consideration.

The Dellwik-Fleischer plant at Ilford is rated at 500,000 cubic feet per day; but Mr. Brown has worked it up to 650,000 cubic feet. The plant is only operated intermittently according to requirements—sufficient gas being made to supply a 500,000 cubic feet relief holder; and, when this is filled, the generation of gas is stopped. "Very simple" is Mr. Brown's epigrammatic reply to an inquiry as to what he thinks of the plant and its working after the months that he has had it in operation.* In his present working, Mr. Brown has set apart two of his horizontal retorts, and one of the inclined retorts, into which he leads blue water gas, and, in conjunction with it, he usually gasifies a small quantity of ordinary Anglo-American gas oil. About the quantities of water gas, some information will be given presently. Of course, the retorts require a little special fitting. Taking the two horizontals first, they are single ovals; and he has converted them for dealing with the water gas by forming an upper and lower chamber in each. He accomplished this by laying a course of bricks right along the bottom, and then on either side a row of bricks on edge sloping towards the sides of the retort. On top of these is laid a row of fire-brick tiles, reaching to within 6 inches of the rear end of the retort; and so an upper and a lower chamber is formed. The joints are all made good with fire-clay, so that there is no leaking from the top to the bottom. The oil is led into the lower chamber (in which the gasification takes place) by a pipe to a distance of about 11 inches from the mouthpiece; and the blue water gas is carried in by a pipe below the oil-delivery pipe. This, however, discharges a few inches behind the oil-outlet, and so sprays the oil into the chamber. A channel-iron bed is provided centrally under the feed-pipes, so that the oil does not drip on to the retort. The stream of gas passes to the rear of the retort, and round into the upper chamber, where the oil vapour is fixed. Perhaps, before proceeding, it should be mentioned here that the gas oil is not used expressly for the illuminating value it imparts to the gas. For enrichment purposes, a small quantity of benzol is employed when required; and Mr. Brown finds that the gas oil forms a base as it were for the benzol to work upon. But more on this point will be gathered as the course of the working experience is unfolded.

Now it was in connection with the horizontal retorts that Mr. Brown's experimental work was carried out. That work was highly satisfactory; but, before committing himself to any big scheme, he thought it advisable to verify his first impressions as regards efficiency and cost. He borrowed two cast-iron cylindrical station meters, by one of which he measured the blue water gas as it flowed to the retorts. The gas oil was also carefully measured every half hour. Then after the water gas had passed through the retorts and mingled with the moderate amount of oil gas thus produced, he sent it through a small water-cooled condenser (fitted with an interior double coil of 2-inch gas-piping), and then measured the gas by the second meter, from which it was sent into the foul-main immediately behind the hydraulic mains on the top of the bench, and there mixed with the ordinary coal gas. Thermometers were fixed in the inlet and outlet of the meters, in the inlet and outlet of the condenser, and at the inlet and outlet of the retorts, so that (with a constant supply of cold water to the condenser) the temperature could always be regulated to a nicety. A four months'

* This article was written a day or two before Mr. Brown left Ilford for Nottingham.—Ed. J.G.L.

constant test was made with this arrangement of plant; and for a long time, a responsible man was in attendance day and night, in order to keep a careful watch on the operations—the reason for this extreme care being that the results were so surprisingly good that Mr. Brown rather feared to hastily accept them as conclusive.

However, assurance being at length positive, Mr. Brown applied the system to his inclined settings, of which he has at present six beds. Incidentally, it may be stated that this inclined bench has been in operation some three years. This year two of them have been reset; but this was only done as it would have been inexpedient to reset the whole of the settings next year, when the work would have been necessary. Considering their service, the retorts in the original beds are in a good state of preservation; and the floors have deviated but little from the level—certainly, not enough to affect their discharge. Throughout, at the time of the visit, the heats were seen to be splendid. The bench was the work of Messrs. R. Dempster and Sons, Ltd. However, all this is by the way. And now as to the arrangements by which the system described in connection with the horizontal retorts is applied to the inclines. One retort suffices for the whole bench. In this case, the oil is raised from the ground floor by means of a small hand pump into a cylindrical tank, holding about 50 gallons, which is slightly elevated above the charging-stage. From this tank, the oil drips, through two pet-cocks, into two ¾-inch pipes. These (which are sealed by a U-bend to prevent the gas backing into them) are led one into the right-hand side of the mouthpiece of the retort, and the other into the left-hand side. The water gas is led from the relief holder direct into the retorts by two 2-inch pipes, which (as well as the oil-supply pipes) can, if occasion needs, be separately used. In the case of this retort, no division is made as described in connection with the horizontal retorts; but for about 8 feet (of the 22 feet length of the retort) on either side is a channel-iron trough, and down this the inrushing water gas (which is fed in above the oil at the pressure of the holder) strikes the oil. The long length of channel-iron carries the gas well down the retort before it touches the fire clay. The quantity of the oil supply is regulated by the pet-cocks previously referred to, and the water-gas supply by cocks which can be locked in any position by means of a perforated quadrant and bar. At the top of the ascension-pipe from this retort, a valve is fixed, by which the pressure of the gas in the retort is regulated. If the valve was worked full open, the pull on the exhauster would draw the furnace gases through the pores of the retort. The dip-pipe in this case has been cut off; and the water gas is passed direct into the hydraulic. By a small pet-cock on the ascension-pipe, the richness of the gas when ignited can be visually tested.

We have described the arrangements by which Mr. Brown utilizes his blue water gas; and now we must retrace our steps to the preliminary experiments made at Ilford, and finally give information as to the actual results being realized. Before the plant was installed, experimental work was undertaken to ascertain what could be done in the way of gasifying oil alone in a horizontal retort divided in the manner explained. The oil was delivered into the bottom of the retort; and by means of an oil-sight feed, the quantity that was being passed per minute, hour, or day could be accurately determined. Then, from the point of view of increased candle power, very good results were obtained—quite as good, we fancy, as anybody else has secured with oil gas working with other processes. But there was a drawback. The lamp-black formed blocked up the retorts; and so the making of oil gas had to be discontinued. It may, however, be mentioned that looking at the voluminous records connected with these oil-gas experiments, and taking two or three results hap-hazard, we have 89, 91, and 70 cubic feet of 18 to 20 candle gas per gallon of oil, costing 2¾d. per gallon.

Immediately the Dellwik plant was ready for working, experiments began on the passing of the blue water gas into the retort with the oil—in the manner previously stated. The temperature of the retort was kept as hot as possible—almost a cherry red. The gas was passed from the retort up the ascension-pipe; and by means of a bye-pass it was carried direct into the hydraulic main. Excellent results as regards the illuminating power of the gas were obtained; but at that time there were no means of ascertaining precisely what was happening—it was all to a large extent a matter of judgment. Then followed the fixing of the two cylindrical station meters, the condenser, and the thermometers, as already explained. Mr. Brown, as his manufacturing register shows, commenced the work with great caution, and moved upwards slowly. The quantity of water gas passed in was small at first, and step by step he increased it. But, in the early stages, the results were to him so remarkable, that he could not understand them. However, he overcame his surprise; and continued to move on until now the process (as earlier described) is an ordinary everyday part of the works' operations.

Still confining ourselves to the experimental work before giving the results, there were one or two other matters that surprised the investigator still more. One arose when employing water gas without any oil at all—the water gas being passed into the coal-gas retort on to the top of the coal charge, after the manner of Professor Lewes's plan. Mr. Brown commenced by putting in 5 per cent. of water gas; and, instead of having a 5 per cent. reduction of the candle power, there was actually a slight increase. Naturally, he at first thought a mistake had been made, and that he had evidently got hold of coal from a superior seam, or that he was not making quite the same quantity of coal gas per ton. He then increased the water gas to 10 per cent., and strange to say got an increase of ½ candle. This continued for many days; and he had to increase the water gas to 15 per cent. before he got any reduction in the candle power—that was, *without using any oil or benzol*. But Mr. Brown found he only obtained these results under certain circumstances; and the conclusion to which he has come is that, in running the water gas in over the coal, "the game is not worth the candle." With a certain class of Durham coal, there were a large number of stopped pipes. It was hoped, with the water gas, that there would be a diminution of this trouble; but in practice there was absolutely no difference. Besides, when there was a stopped pipe, and water gas was being used, the coal gas had a tendency to back through the water-gas pipe, and to fill up everything with tar. This is not the result of an experience with the Lewes process of a day or a week, but of experiments carried on over a period of four months.

Another method that Mr. Brown has tried, with astonishing success, is simply to superheat the water gas by passing it through the retort set apart for the purpose, and then run it into the foul main. To the bulk of the water gas, he adds coal gas in regulated quantities along the length of the foul main until the water gas at the end of the main only represents about 15 per cent. of the whole. His view is that, by first passing hot coal gas into a large bulk of diluent gas, the tarry vapours and hydrocarbons of the latter remain in solution in the water gas; and hence the good results. When oil is not used, this is the system that is adopted at Ilford.

Now we come to the results of the methods of dealing with the blue water gas as adopted at Ilford; and the statement may be ventured that they will be regarded as eminently favourable, if not surprising. From the time the plant was started (May 11) until the date of a visit a fortnight since, 20,823,000 cubic feet of blue water gas had been made; and the benzol used for enrichment in that period only amounted to 2603½ gallons. Now looking over the manufacturing records, and taking a few examples at random, here is what may be taken as a present ordinary average day, referring as it does to Friday, Dec. 12: 158,900 cubic feet of water gas were made, and 705,100 cubic feet of coal gas. The candle power of the gas supplied at Ilford is 16 candles in the evening, and 15 candles during the daytime; but on the day named, the total benzol used was only 22 gallons. During the summer time, when the weather was warm, or to be precise from the time the plant was started until Aug. 17, no benzol was used; and it was only on the latter date that a start was made with it. Turning back the register to an average summer day, the figures are: 105,000 cubic feet of water gas, and 333,800 cubic feet of coal gas. No benzol was then employed; but at that time from 25 to 30 gallons of ordinary gas oil were being used per twenty-four hours. Some odd days were noticed to be striking examples. A trial has been made with as much as 40 per cent. of water gas per day, and there was not the slightest difficulty or complaint. Running roughly over the returns, we notice these for one day: 146,100 cubic feet of water gas, and 334,900 cubic feet of coal gas. No benzol was used that day. Here is another day with 100,000 cubic feet of water gas, and 280,000 cubic feet of coal gas. Repeated examinations have never revealed a greater drop than 5 per cent. in calorific value. The estimate of the cost of the water gas is 2¾d. per 1000 cubic feet—that is, charging coke to the plant at 15s. per ton, which is a high figure. It must be granted that these results are remarkable, and are a full justification for the adoption of the plant.

We have the permission of Mr. Brown to publish the results of a trial test made with the plant; but the explanation should be offered that the figures as to cost are not altogether fair to the plant. It will be noticed that 6s. is charged for an extra youth required specially for the test; and carrying coke and clinkering for the purpose is entered at 8s. 1d. These two items make 14s. 1d. (of the £1 11s. for labour) for which the test is really accountable. Notwithstanding these special charges, the cost, it will be seen, only works out to less than 3½d. per 1000 cubic feet. The report on the test is as follows:—

We have this morning concluded a test of our Dellwik-Fleischer water-gas plant, which we have conducted ourselves; and as the results obtained are so striking, I append them—

Duration of test	17 hrs. 45 mins.
Total gas made	470,000 cubic feet
Water used in boiler	2840 gallons
Coke used in generator	6 tons 4 cwt.
Make of gas per ton of coke	75,806 cubic feet

The cost of gas making in the above test works out as follows:—

Labour—			
Gas maker	8s.	10d.	
Boiler man	8	1	
Extra youth for test	6	0	
Carrying coke and clinkering	8	1	
		£1	11 0
Coke at 16s. 8d. per ton (current selling price)		5	3 4
Water		0	1 6
Oil		0	1 0
		£6	16 10

Cost of 470,000 cubic feet . . . £6 16s. 10d.

Cost of blue water gas per 1000 cubic feet . . . 3·43d.

I also have pleasure in giving you the results of the first six months' working of the plant, from May to November, 1902.

During this period, we have made 15,500,000 cubic feet of water gas with an average yield of 63,000 cubic feet per ton of coke used in generator; but this figure includes the coke consumed in the generator during its intermittent working, as well as all experimental runs.

The proportion of water gas which has been mixed with the coal gas during that period has been, on an average, 25 parts of blue water gas to 100 parts of coal gas, or 20 per cent. of the total gas made; the lighting efficiency being equal to 16 candles.

During the same period, the total quantity of benzol used for enrichment has been 1447 gallons, or an average of less than one-tenth of a gallon per 1000 cubic feet of water gas used.

So far as I can ascertain, the use of water gas as above has made no appreciable difference to the tar obtained from the coal gas.*

As a matter of interest, it may be added that Mr. Brown has an 8-horse power "National" gas-engine which he employs for elevating the coke for the water-gas plant. In this engine he uses blue water gas; and he finds that the difference is, in doing the same work, as between 160 cubic feet of water gas and 100 cubic feet of coal gas. The diminution in the horse-power obtainable from the engine is hardly appreciable.

We think it will be conceded by all who read these notes on Mr. Brown's working of the Dellwik-Fleischer plant at Ilford, that they form a valuable contribution to the much-debated subject as to the best method of applying water gas in order to get what gas-makers are always aspiring after, and that is the highest and most economical results from their manufacturing operations.

PERSONAL.

Owing to ill-health, Mr. J. SMITH has resigned the position of Engineer and Manager of the Annan Gas-Works, and Mr. R. M'GILL, of Denbigh, has been appointed his successor. Mr. M'Gill was formerly at Carlisle.

At the recent competitive examination for H.M.S. *Britannia*, Mr. F. A. BUCKLEY, son of Mr. J. W. Buckley, of Falmouth, gained the thirteenth place out of 72 successful candidates. Until recently he was at the Falmouth Grammar School, where he was educated.

OBITUARY.

The death is announced of Mr. R. L. Bourne, the Chairman of the Wilmslow and Alderley Edge Gas Company. Deceased was one of the oldest members of the District Council, and was Chairman in 1896.

To Make India-Rubber Gas-Tubing Water-Tight.—India-rubber gas-pipes sometimes allow a certain amount of gas to escape. In order to prevent this, they can be coated with a mixture made as follows: Dissolve five parts of gum arabic and three parts of molasses in fifteen parts of white wine. Then add gradually, while stirring, six parts of alcohol. This recipe, which has a very odd appearance, was originally given in the German publication "Sueddeutsche Apothekerzeitung," and was recently quoted in "La Nature."

The "Speedon" Radiator.—We learn that Mr. A. Ernest Kitson has severed his connection with the Kitson Light Company, and has commenced business as a heating and lighting engineer at Palace Chambers, Victoria Street, Liverpool. His considerable and varied experience in these directions cannot fail to be of great advantage to his clients. Among other things, he has undertaken the agency, from the Coalbrookdale Company, for the sale, in the north-west of England, of their "Speedon" gas-radiators, of which testimonials speak very highly. It is an entirely new production, and combines within itself a complete hot water circulating system—being boiler, circulating pipes, and radiator in one body of a highly ornamental exterior. Among the stated advantages are: "It can be placed anywhere; takes up little space; and is perfectly safe and odourless." The expense per hour, too, is put at less than the smallest valued coin of the realm. The radiator is made in various sizes, and is cheap. The smallest size is 2 ft. 8 in. in height over all; it only requires 20¼ in. by 10¼ in. standing space; and it has a heating surface of 14½ square feet, which, the information is given, is sufficient to heat a room 13 ft. by 12 ft. Missing the intermediate sizes, the largest one is 3 ft. 8 in. high, requires a standing space of only 26¾ in. by 10¼ in., and has a heating surface of 27 square feet—this being equal to the heating of a room 17 ft. by 16 ft. All that the radiator demands of the user is that the water-reservoir shall be replenished occasionally. The radiator is a neat structure, is well built, and can be had decorated in any manner suitable for its destined position.

* Mr. Brown is having very careful tests made of the tar; and the results we hope to publish as soon as ready.—ED. J.G.L.

NOTES.

Asphalting Concrete Water-Pipes.

It is well known that concrete vessels and pipes will not long withstand the effects of acid liquids, and even when conveying water rich in carbonic acid they release quantities of lime. According to M. de Schönbrunn, coating them with fluosilicates has not given good results; a reservoir coated with fluosilicate of lead, and containing fresh water with a certain amount of free carbonic acid, having corroded in various places. "Industria" says it is to be noted that carbonic acid is more noxious the greater the purity of the water—*i.e.*, the smaller the proportion of earthy salts in solution. The sides perfectly smoothed and lined with a coating composed of equal parts of cement and sand were almost unchanged, and those coated with asphalte varnish withstood perfectly the effects of acids at temperatures which do not melt asphalte. In the sun and hot weather, therefore, it would be possible to rely on asphalt. Varnishing with this material requires certain precautions, because when applied to cold walls it rapidly hardens and does not adhere. It is well to first coat with asphalte diluted with a solvent, and when dry give it a thicker coat. The surface should be smoothed with a hot iron roller.

Preservation of Structural Steel in Concrete.

Speaking of the durability of structural steel work where embedded in cement mortar, Mr. A. L. Johnson gave the American Society of Engineers some information based on the results of an examination of large buildings in Chicago. A Commission was appointed to investigate this subject, upon representations to the effect that the buildings in question were dangerous. The Commission examined a number of houses of composite construction, and discovered numerous examples of the corrosion of columns. The beams in the foundations and elsewhere were found to be in perfect condition. The Commission's recommendation was that in future all steelwork of buildings should be entirely surrounded by portland cement or lime mortar, and filled in solid with the same. In St. Louis, a well-constructed composite building has just been dismantled after twenty years. The steel throughout was found to be in a thoroughly good state of preservation; it having been in all cases embedded in portland cement, mortar, or concrete. The paint also remained in a good condition; the concrete having assisted to preserve that also. The question of the effect of cinder concrete on iron having been raised, Mr. Johnson had samples of steel embedded in such concrete lying exposed to the weather for three years. At different times one of these samples would be broken up to see what it looked like inside. In every case the metal was as bright and clean as on the day it was put in, though the cinders used were very poor and dirty. The speaker recommends that the fine stuff should be screened out of cinders intended for concrete, because the former contains most of the sulphur, and would cause the water used in mixing to act on the metal until such time as the concrete had dried out. Thus a slight skin of rust—not in itself materially injurious—would be formed on this metal. As to the relative durability of different kinds of engineering structures, Mr. Johnson is of opinion that only a few forms of stone masonry can compare in length of life with a well designed and made concrete structure reinforced with steel.

Pumping Natural Gas.

In the course of the exhaustion of the natural gas supplies of the United States, the gas is being pumped to constantly increasing distances. At the present time, Pittsburgh is receiving gas from Doddridge County, Western Virginia, more than 100 miles distant; Akron and Canton, Ohio, are being supplied from Wetzel County, a distance of 150 miles; and arrangements are reported to be in progress for piping natural gas more than 200 miles from the source. The pipes used for the purpose range in size from 2 up to 36 inches in diameter. Steel or wrought-iron mains are chiefly employed, with lead socket, or flanged and rubber ring joints. A line of riveted steel pipe, 36 inches in diameter, extends from Pittsburgh 20 miles to the southward, and cost approximately £10,000 per mile. At times of maximum demand, it passes over 100 million cubic feet of gas daily. In the aggregate, there are 25,000 miles of natural-gas mains in operation. Usually, the pressure relied upon for distributing the gas is the ordinary rock pressure of the wells; but in places this has fallen so low as to require mechanical assistance. For the addition of anything up to 10 lbs. pressure, rotary blowers are employed; but for higher pressures a cylinder gas-compressor is necessary. A good example of this kind of plant is a gas-power compressor made by Mr. John S. Klein, of the National Transit Company, of Oil City, which has four single-acting power cylinders 25 inches in diameter and 48 inches stroke, acting directly upon two first-stage, and two second-stage compressor cylinders. It is stated that with this machine the consumption of natural gas for creating the power is after the rate of 1 cubic foot for 30 cubic feet of the same gas compressed from atmospheric to 270 lbs. gauge pressure. Some compressing plants are driven by steam, generated by burning the gas. In this way an indicated horse power can be obtained for 16 cubic feet of gas. The gas is sold by four different systems—by meter; by Pitot tube measure; by computation, based on the initial and discharge pressures; or by the yield of the well,

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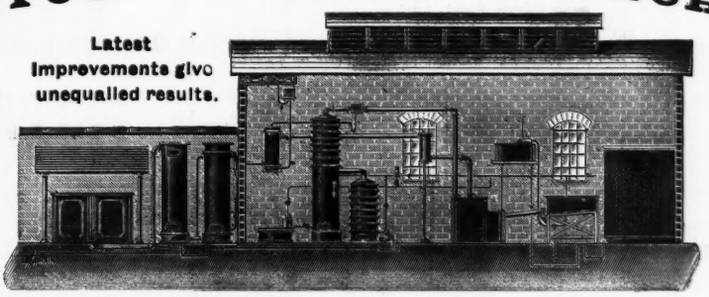

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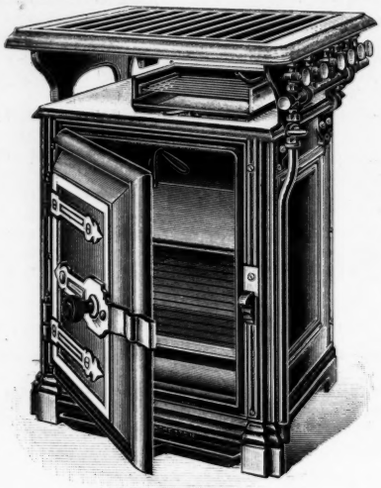

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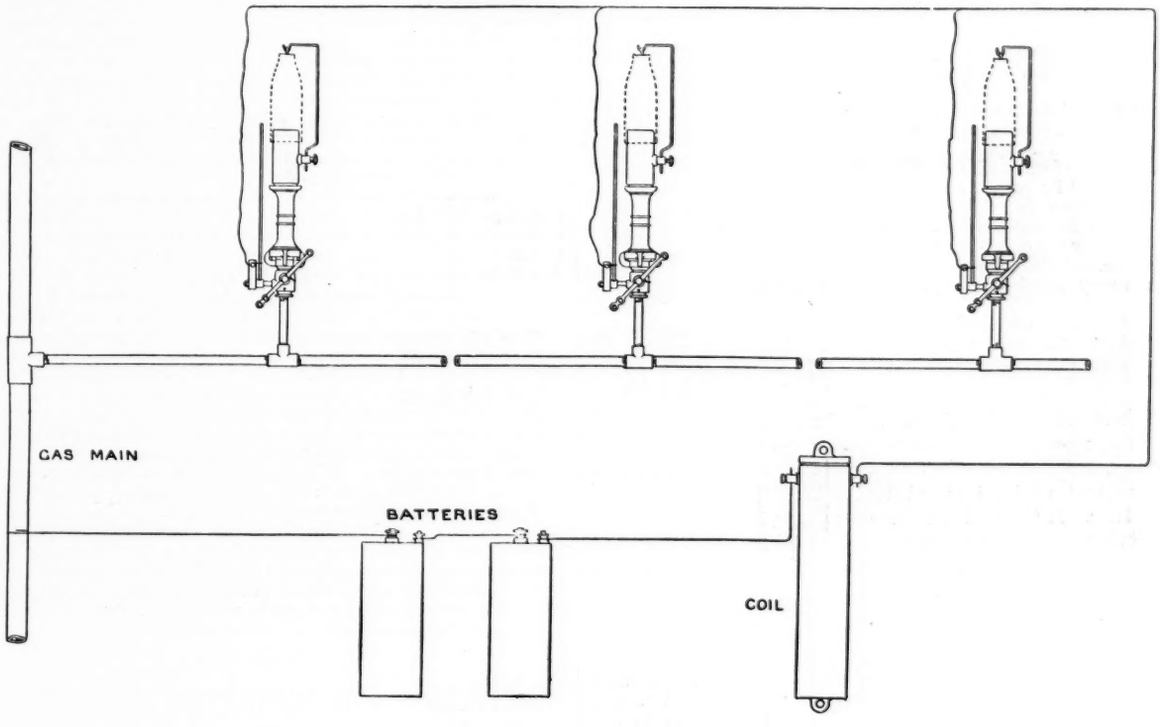
LIGHTING OF FACTORIES AND WORKSHOPS.

Attention has recently been drawn to the attitude of insurance companies towards the use of incandescent lights in textile factories; and this affects high as well as low pressure incandescent lighting. The opposition of the insurance people, as marked by the increased premiums they charge on factories lighted by such means, is a matter in which a large and important section of the gas industry is concerned, and therefore a matter upon which all information that will assist in enabling them to meet the objections will be welcome. One of the chief of these is the use of bye-pass or pilot lights; and, in this connection, it is a satisfaction to find that the Fire Offices Committee are open to the consideration of reasonable substitutes for the constantly burning igniting-jet. This is shown by the fact that they have been satisfied by the James Keith and Blackman Company, Limited, as to the absolute safety in such establishments of a simple system of ignition by electrical means which they have patented; and the Committee have modified their rules to admit of its employment, without the extra premium hitherto charged where bye-pass or pilot-lights are used. This concession is alone a valuable testimony to the performance of the arrangement, which is ingenious, of extremely simple parts, and can be adapted to any ordinary or high-pressure incandescent burner.

The fittings merely comprise a modest little device for each burner, a battery of two or three ordinary dry cells, and a single wire running round the premises, with a branch wire to each burner. One pole of the battery is connected to the main gas-pipe, and the other pole to an insulated wire, from which the branch wires are run. At some convenient point in the installation, the insulated wire is connected to a plain coil of wire neatly encased, which intensifies the spark. The illustration shows the simplicity of the device fitted to the burner. There is a vertical bye-pass tube carried on an arm leading from the side of the burner parallel with the cock-lever when in a horizontal position. On the end of this arm, and at the base of the bye-pass rod, is fixed an insulated block, from which protrudes a small curved wire. Then, on the inside of the lever of the cock, is also a small arm carrying a spiral wire. This wire represents one pole of the battery; and the wire fixed to the insulated block, the other pole. Now starting with both cock and bye-pass off, to use the lighter, the right-hand chain is pulled down until the lever-cock reaches the end of its full travel. During this movement, the terminal wires come into rubbing contact with each other; and, on breaking contact, a spark is formed, which ignites the gas that has obtained passage to the bye-pass tube during the movement of the cock. The tube is perforated with about twelve pin-holes. The bottom jet ignites, and the others follow suit in rapid succession, after the manner of the climbing type of igniters for street-lamps that were introduced some time since. In the case of this electrical igniter, however, there is nothing ugly about the fitting; the bye-pass tube being only of ordinary dimensions suitable to the type of burner to which it is attached. The perforations in the tube are so made that the uppermost jet is at right angles with the bottom one, and thus it impinges direct on to the mantle, and lights the burner. What has been described is all that is required and all that takes place to bring about ignition; but there is one other little point to be explained. On pulling down the chain to operate the cock-lever, a strong spring, securely fixed round the external portion of the plug of the cock, comes into contact with a peg in the body of the burner; and, on the chain being released, this brings the plug back so that the gas-way to the burner is fully open—thus shutting off the bye-pass, and holding the electric contacts well apart. There is no possibility of running the batteries down through carelessness or by contact being continued; the spring absolutely preventing such a contingency. By its operation, too, the bye-pass is always shut off after it has accomplished its object; and so the gas consumed by it is infinitesimal—only a momentary passing of gas being required to light the burner.



THE SYSTEM OF IGNITION AS APPLIED TO HIGH-POWER GAS-BURNERS.

In places where this method of ignition is applied, there are no pilot-lights going during the time the works are closed, or during the day; and the gas may be completely shut off when closing the premises for the night, which is impossible where pilot-lights are burning. So it is seen the main objection to the use of gas (and incandescent lights in particular) and matches in textile or other factories is wholly surmounted, in an easy, cheap, and absolutely safe manner. The details of this ingenious device have been well thought out; it is a substantial little thing; and the question of maintenance is one that can be of only periodical concern, and a comparatively inexpensive matter. An opportunity has been afforded for testing a number of these devices; and in every case their action was certain and perfect.

In conjunction with the above system of ignition, we may briefly describe a form of reflector pendant lamp which the same firm have produced for the lighting of factories and workshops, and in which they have given special attention to the requirements of such establishments. The lamp is a neat fitting, with ample reflector for the downward distribution of the light. The illustration (p. 1750) is not the newest type of the lamp, but it serves the purpose of conveying the principal points. It shows the style of lamp that has been very successful; and the improved form should be found even more so. The lamp is simply suspended by a hook from a spring anti-vibrator, and the gas is conveyed to the supply-pipe by a piece of flexible tubing. The reflector in

the new form is surmounted by a cowl, which disperses the heated products of combustion laterally, instead of permitting a constant direct upward current. The lamp is also fitted with a special shaped, flanged globe, which is suspended from the reflector (which is recessed for its reception) by a simple trigger arrangement. When cleaning the lamp, the globe is simply slipped down, and rests on the hook shown at the bottom of the fitting. The serviceable appearance of the lamp is very pleasing.

A small improvement has been effected in the Company's burners by which the noise of which complaint is made in connection with the high-pressure system has been considerably reduced. The improvement is simply a special form of nipple; but its use is not recommended in positions where a little noise is not objectionable. It will be found very useful in such places as churches and halls.

THE FACTORY REFLECTOR PENDANT.

UNIFICATION OF STANDARDS.

The Standardization Committee, who began their operations in June, 1901, have reached some very definite results in their labours, and have agreed upon a series of recommendations with several trades using iron and steel, which will be published immediately. It is hoped that these recommendations—possessing the authority of so representative a body of practical men—will enable the great spending departments of the Government to effect considerable saving, and enable British producers to meet the competition of Germany and the United States.

The movement was unofficial in its origin; but the Government departments have been in entire sympathy with the work of the Committees, and have co-operated in their labours. At the annual dinner of the Iron and Steel Institute, Mr. Arnold-Forster, M.P. (Under-Secretary to the Admiralty), called attention to the enormous importance of standardization and uniformity of tests, and to the fact that England was far behind the Continental nations. In this respect, he said the Government departments were the principal sinners. For example, in the matter of tensile tests, a big steel works which he visited was using one test for the Admiralty, another for the War Office, another for the Board of Trade, another for one set of railway companies, a different one for another set, others for the Egyptian Government, the Indian Government, and the Continent of Europe. This, he said, was like trying to live in a world where they were measuring pints by fourteen different kinds of pots. He urged the Standardizing Committees to go forward with their work as rapidly as possible; and he advised them to go to the Government for additional support. Shortly afterwards, a deputation had a private interview with the Prime Minister, and they received from him assurances of the assistance of the Government.

The movement owes its existence to a resolution of the Council of the Institution of Civil Engineers in favour of the appointment of a Committee "to consider the advisability of standardizing the various kinds of iron and steel sections, and, if found advisable, to consider and report as to the steps which should be taken to carry such standardization into practice." The Iron and Steel Institute, and the Institutions of Mechanical Engineers, Naval Architects, and Electrical Engineers were asked to co-operate; and a Committee was appointed to undertake the work. This Committee, which became known as the Main Committee, consisted of seven representatives, and two each of the other Societies co-operating. The Committee began their operations by taking evidence on the advisability of standardizing rolled sections, and were so convinced of the importance of proceeding with this work, that they determined to form a number of Committees to deal with the matter in detail. Four were appointed, with the Chairmen named: For ships, Mr. A. Denny; for bridges, Sir Benjamin Baker; for railway rolling stock underframes, Sir Douglas Fox; and for rails, Sir John Wolfe Barry. These Committees have gone most carefully and minutely into the various sections required in the different branches of engineering with which they are connected. The Ships, Bridges, and Underframes Committees have also held joint meetings at various times to discuss questions where their respective spheres of operations overlapped; and they have now decided upon a joint series of standard sections, which have been adopted by the Main Committee, and which will shortly be published. The Rails Committee are still considering the question.

The work has grown as the Committees have proceeded, and the original reference has been enlarged, so as to include Committees on the standardization of tests and specifications for iron and steel material used in the construction of ships and their machinery (presided over by Mr. A. Denny); a Locomotives Committee, under the chairmanship of Sir Douglas Fox; and an Electrical Committee, with Sir William Preece as Chairman. The Committee entrusted with the subject of the unification of tests is a very important one, for it will harmonize the standardization of sections with the requirements of the engineers, and thus remove one of the greatest difficulties of the British steel maker, who considers that he is greatly handicapped by the unreasonableness of the different tests applied.

There are now 15 different Committees and Sub-Committees (composed of 102 members of the most eminent men in the great iron and steel industries), to which the Government Departments contribute 14 representatives; and, in addition to the Institution already mentioned, representatives have been appointed by the Institution of Engineers and Shipbuilders in Scotland, Lloyds, the Incorporated Association of Municipal Engineers, the Light Tramways and Railways Association, the Railway Companies' Association, the Railway Engineers' Association, and the International Testing Association.

As an illustration of the work which has been done, it may be stated that the Sub-Committee dealing with structural steel have reported that for "channels" there should be 23 standard sections, instead of 63 previously rolled (the Germans having 20 and the Americans 14 standard sections). Then in "angles of unequal sides," 30 standard sections in the place of 59 previously rolled (the Germans having 14 and the Americans 18). In "beams," 30 standard sections in place of 49 previously rolled (the Germans having 33 and the Americans 17). The Committee add that there are at present 71 different sizes of tram-rails rolled—the difference among them being insignificant—and they propose to reduce the number to five, ranging from 90 to 110 lbs. It has been estimated by an experienced steel maker that the effect of standardizing these rolled sections for structural steel alone will effect a saving of 5s. per ton. This should secure an annual saving of £75,000; and it will obviate the waste of capital by having special rolls and tools in order to produce odd sizes.

The engineers, shipbuilders, steel merchants, and the iron and steel makers of the country are pressing upon the Standards Committee to publish their series of standard sections at the earliest possible date. It is understood that the necessary authorization has been obtained, and that early next month most of the conclusions of the Committees will be published.

DETECTION AND PREVENTION OF UNDERGROUND POLLUTION.

By JOHN SHAW, of Boston.

[Extracts from a Paper read before the British Association of Water-Works Engineers, with a Summary of the Discussion.]

As the primary source of all water supplies is the rainfall, it can hardly be said that there is any essential difference between "surface" and "subterranean" water. Rain, when it falls on the earth, pursues, under the action of gravity, the easiest route from the point where it fell to the sea, or other natural outlet, and there is therefore at all times a large quantity of water travelling underground as well as upon the surface. The former may appear at some spring, or may be intercepted by a well, just as certainly as a stream may be intercepted above ground. The laws which govern the yield of wells and springs are fairly well understood by water engineers. But, even so, it is always necessary to examine the nature of the strata, and the depth of the water-line below the surface, before deciding upon the diameter or depth of the well or borehole; and, even with this knowledge, difficulties of observation, and consequent ignorance of facts as to the underground watershed, often make it an impossibility to forecast the yield of any given well. Similar uncertainty exists in regard to the pollution of underground water. In water supplies furnished by streams or rivers which drain impervious gathering-grounds, the whole course of such streams is open to the light of day. All sewers or drains from farmyards, &c., any sheep-washing, or other acts likely to pollute the water can be

observed; and it is only by some wilful or careless act that a stream can be polluted. On pervious soils, more especially in the neighbourhood of large towns, such safeguards do not exist; and we are startled every now and then by some epidemic of typhoid being traced to some source of water supply which a few weeks previously had been above suspicion.

Underground water, mainly owing to its more intimate contact with the various mineral substances which form the earth's crust, generally contains a much larger amount of dissolved mineral substances than river or upland waters. These impurities—chiefly lime and magnesia, and sometimes iron—unless in excess, are rarely considered detrimental to the use of the water for dietetic purposes, although for washing and manufacturing purposes they prove somewhat objectionable. But processes exist—mainly modifications of that discovered by the late Professor Clark—which remove to a great extent the hardening matters in solution.

In some districts, more especially near the sea, deep wells yield salt or brackish water. This may arise from two causes: The first, as in some New Red Sandstone districts where there are beds of salt in the formation, or in flat alluvial-covered districts where the sea has covered the surface in comparatively recent times; in the other case, wells sunk in the first instance to intercept water flowing towards the sea have been pumped too heavily, with the result that the direction of the flow has been reversed.

If underground water is usually more exempt from matters in suspension, and also from vegetable organic impurity as compared with surface supplies, it is much more liable to unseen pollution—direct or indirect. In the case of surface (lake or river) water, pollution can only take place by the direct discharge of sewage into them, the manuring of land within the drainage area, and the storage of manufacturing and domestic refuse, all of which can easily be seen, and, with ordinary care, prevented. With underground water, cesspools, leaky sewers, and even sewage farms are sources of danger which may exist for years unnoticed; and very often when the danger is pointed out, the man who sounds the note of warning is called a faddist—or perhaps something worse—and nothing is done until an epidemic occurs. Then, of course, an inquiry is held by the superior powers, and a great outcry is raised. But surely this is locking the stable door after the horse is gone.

Even when sewers are made with the greatest care, they are not always water-tight. In some cases, large quantities of spring water find their way into them; and there is no reason to doubt that, were a fall in the underground water-level to take place (from exhaustive pumping or otherwise), the direction of the flow might be reversed from the sewer to the subsoil. Water will also undoubtedly travel by the side of a sewer for long distances.

The obvious remedy for such an unsatisfactory condition of affairs as has been instanced is to rigorously exclude every possible source of pollution, to insist on the closing of all cesspools in the neighbourhood of the source of supply, and to see that all shallow wells are constructed on proper principles. The chief precautions to be observed are: Buying a "protective area" round pumping-stations, lining deep wells with iron tubbing for a considerable depth below the surface, boreholes should have their upper portions securely lined, and, where they start from the bottom of wells, concrete floors should be constructed so as to make a water-tight joint round the upper bore-tubes, and thus prevent any surface water gaining access to the boring or well. The variations of the water-level in wells and boreholes, due to either natural causes or to pumping, should be carefully noted, as well as the quantity of water drawn in each case; and observations should be recorded, showing the effect of such pumping on any springs and wells in the neighbourhood. Analyses of the water should be taken at frequent intervals, more especially when heavy rainfall follows a long drought, and causes a rise of the water-level.

One word, in conclusion, on another important point. Deep-well water may be organically pure in consequence of its having been slowly filtered through deep-seated rocks, which have oxidized the impurities it contained when it passed through the surface of the earth; and, generally speaking, underground water is free from the innumerable micro-organisms which infest all surface waters. But it must be remembered that the relative danger or value of these germs is still a disputed point with scientists, although there can be no doubt that certain groups are typical, and possibly productive of typhoid fever and other zymotic diseases. We are also assured that such organisms exhibit a more marked vitality in sterile deep-well water than in surface water of more doubtful purity. The water engineer, aided by some simple chemical tests, can do a great deal in the direction the author has indicated, but he is utterly powerless to cope at all effectively with organisms so minute that many millions may exist in a space of only three-eighths of an inch cube, and 25,000 of which placed in a line would represent 1 inch in length. Here the aid of the bacteriologist must be invoked. But at the same time, the engineer should at least take reasonable precautions to preserve the well or boring from contamination, such as may often arise from the clothing, and especially the boots, of workmen employed in them. The author also considers it essential that on no account should water from deep wells be exposed to light or air until it is drawn from the consumers' taps. He is also inclined to advocate the filtration of all water supplies, whether derived from the surface, the subsoil, or deeper-seated sources. But in this no doubt his views may not be shared by all at present, as there is a difference of opinion as to whether even surface waters all require filtering; and, in advocating the filtration of bright clear water drawn from the chalk, or the new red sandstone, he is conscious that he will be considered somewhat in advance of his times.

Discussion.

Mr. WILLIAM WHITAKER, F.R.S., F.G.S. (Croydon), said the subject brought forward was a big one. In many large cases, they were unable at present to take proper protective measures without some further legislation or investigation into the matter. In smaller cases it could perhaps be done; but, in a considerable number of instances at present, he did not see how, until additional assistance was afforded, sufficient protective area could be readily obtained. It would involve very great expense. It was curious to see how, the moment a water authority was known to want an area round a works for the prevention of contamination, the value of the land increased; and until there was some possibility of securing land at a reasonable rate, it was very difficult indeed to expect many authorities to do very much. Of course, where they had to get compulsory powers, it was a costly business; but he hoped that something would be done to put it in the power of authorities to do what they ought to do without being fined for doing it. As to the question of pollution, with open supplies, they could see what was going on; but, with underground supplies, it was difficult to trace out what might happen. Each case must stand on its own merits. They could not generalize, and say that a certain thing would not happen within any distance. In his opinion, there ought to be some authority in every district or county who should have the power to summarily stop cases of pollution about which there was no question. He was afraid the law was not strong on this point.

Mr. W. INGHAM (Torquay), referring to the author's statement that he was inclined to advocate the filtration of all water supplies, said he was not so certain that in this he would be "considered somewhat in advance of his times." If there was any truth in the remarks made in a paper by Mr. Caink, the City Engineer of Worcester, he (Mr. Ingham) was not sure that water engineers would not have to take into consideration the question of the filtration of the water from chalk and other underground sources, because Mr. Caink proved—at all events to his own satisfaction—that the zymotic death-rate from well waters was far in advance of river waters.

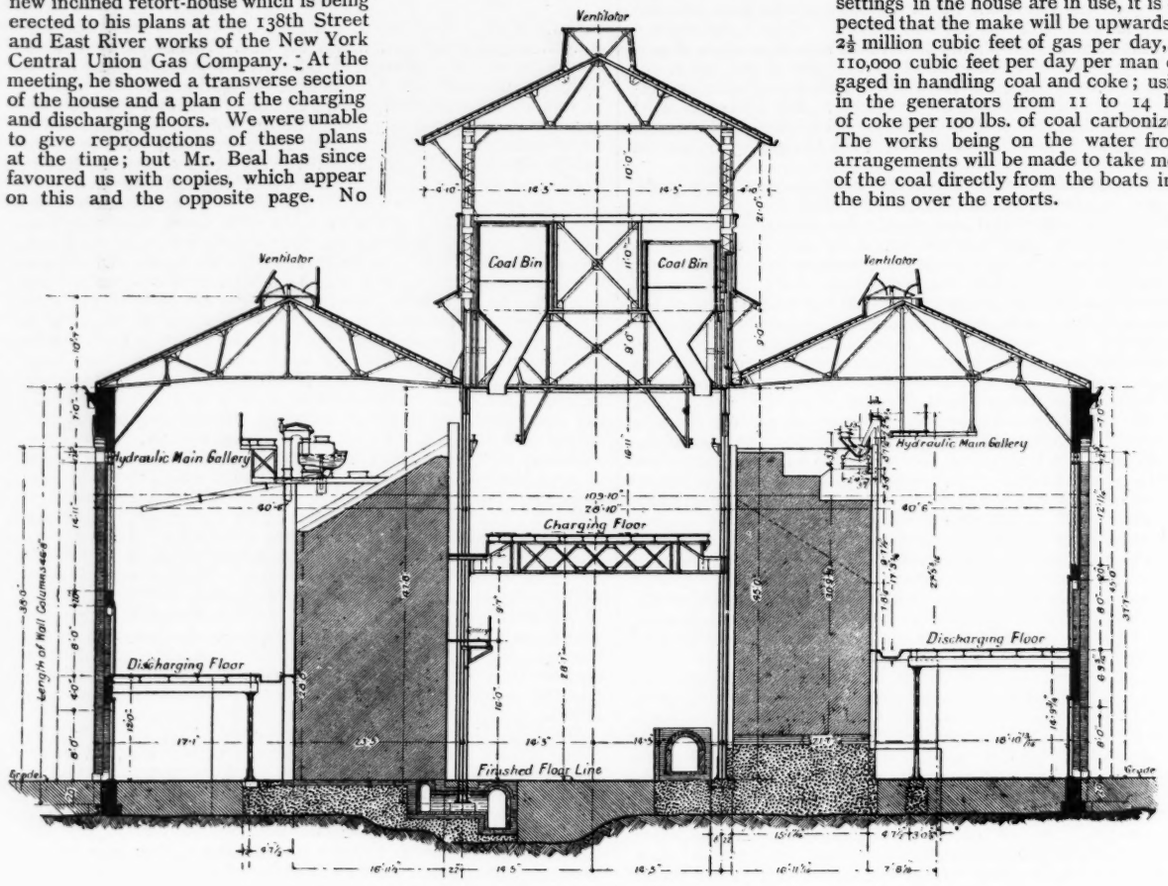
Mr. C. E. JONES (Leyton) thanked Mr. Shaw for advocating the use of river water, and for thus indirectly condemning the use of underground water. As he pointed out, all sources of pollution on gathering-grounds were open to the light of day, and could be observed; but underground water was liable to unseen dangers. This proved that river water was, after all, the best supply, and the more copious. He thought it would be a long time before the engineers of this country would depart from river supply, and take to that of underground water. He must, however, demur to the author considering that he would be in advance of his time if he advocated the filtration of all waters. He (Mr. Jones) did it himself at the Birkenhead meeting, and some years previously. It was quite true that it did seem an absurdity to filter water that was already pure. But it was the more liable to atmospheric and surface pollution; and, in his opinion, it should be passed through a filter, and never see the light of day until it was drawn from the consumers' taps.

The PRESIDENT explained that Mr. Shaw had various experiments in hand, the results of which were not yet complete; and he would probably supplement the paper at a future meeting.

Mr. SHAW, in his reply to the points mentioned in this summarized report, also referred to the question of land rising in value when required for water-works purposes—particularly when the proposal to acquire it got before a Parliamentary Committee. He could not here discuss Mr. Caink's paper; but he might allude to one unfortunate statement in it. Mr. Caink alluded to three of the London water supplies; and he instanced cases where the water was from wells, and in the districts supplied there were a greater number of cases of typhoid fever than in others. He (Mr. Shaw) did not think the wells were altogether to blame in this matter. Mr. Caink spoke about the New River Company supplying well water. Perhaps half the supply at times was derived from deep wells; but nearly the whole of the deep-well water was filtered afterwards. In fact, with the exception of two wells, he believed the whole of the water pumped by the Company was filtered; so that, if filtration was a safeguard, it would disprove Mr. Caink's argument. In the case of the East London Company, they took most of their supply from the River Lea. When the Lea was not giving them a great quantity of water, they had to go to wells, or else borrow from their neighbours. Mr. Caink argued that there was a large amount of typhoid fever in the East London district; but he (Mr. Shaw) did not think it would follow that it was because they used a quantity of well water. The President had referred to some experiments he was making by putting salts in the earth—more especially lithia—to trace the travel of water underground, and also the conditions in which it went into the soil. He had not finished these experiments; but he could tell the members not to put their trust in either salt or lithia. It gave one possibly an idea; but its work was not to be depended on in the detection of the pollution of underground water.

THE NEW RETORT-HOUSE FOR THE CENTRAL UNION GAS COMPANY, NEW YORK.

In the course of his Inaugural Address to the members of the American Gaslight Association, the principal portions of which were given in the "JOURNAL" for the 11th ult. (p. 1279), Mr. W. R. Beal, the President, alluded to a new inclined retort-house which is being erected to his plans at the 138th Street and East River works of the New York Central Union Gas Company. At the meeting, he showed a transverse section of the house and a plan of the charging and discharging floors. We were unable to give reproductions of these plans at the time; but Mr. Beal has since favoured us with copies, which appear on this and the opposite page. No detailed description is necessary, as the various dimensions are clearly given on the drawings. The plans should, however, be examined in connection with the particulars Mr. Beal gave. It may be pointed out that, when all the settings in the house are in use, it is expected that the make will be upwards of 2½ million cubic feet of gas per day, or 110,000 cubic feet per day per man engaged in handling coal and coke; using in the generators from 11 to 14 lbs. of coke per 100 lbs. of coal carbonized. The works being on the water front, arrangements will be made to take most of the coal directly from the boats into the bins over the retorts.



CROSS SECTION OF THE HOUSE.

PURIFICATION OF ACETYLENE.

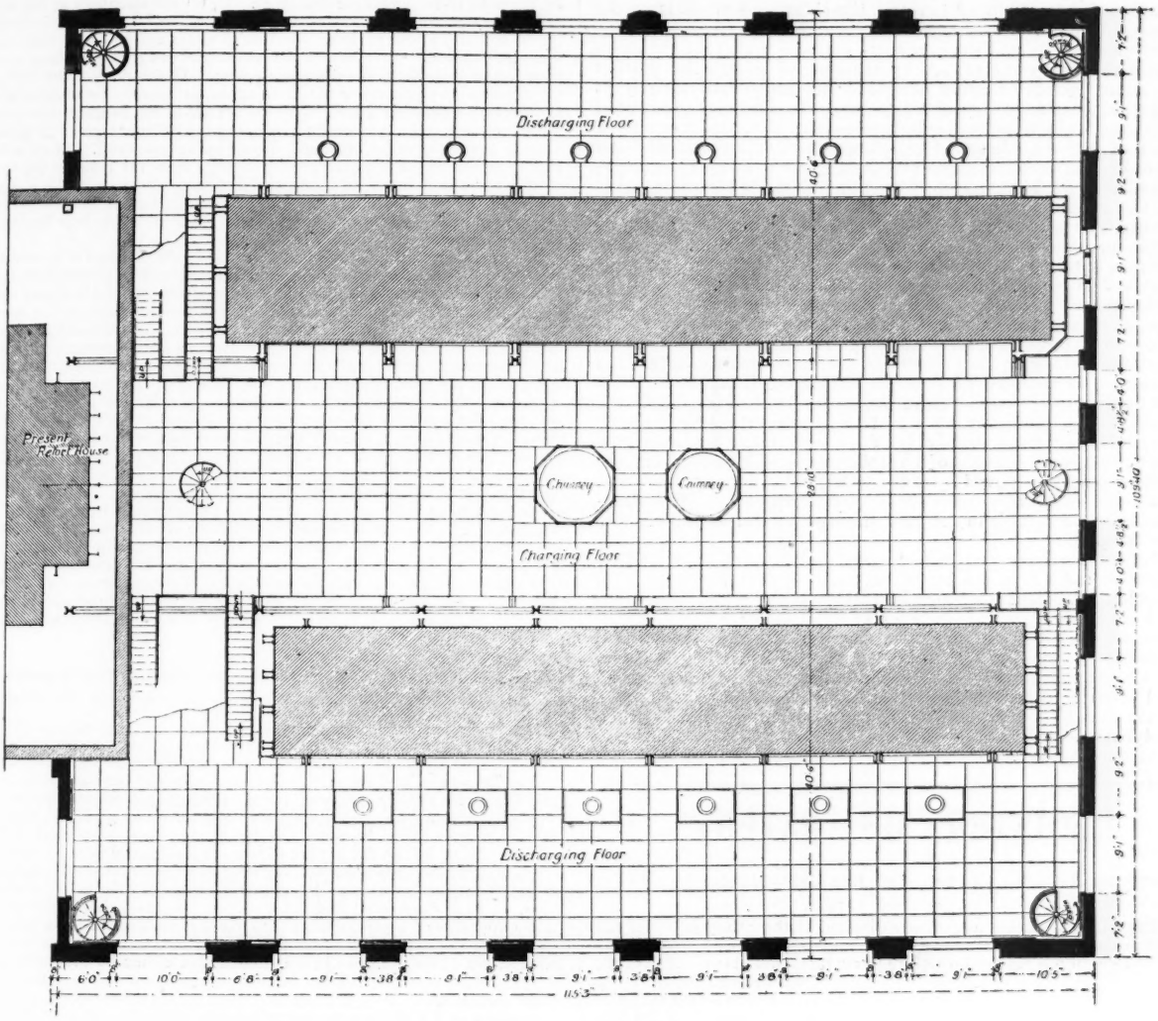
Recent numbers of the "Journal für Gasbeleuchtung" contained a series of articles on the above subject by Herr G. Keppeler; and an excellent abstract of them, prepared by Mr. F. H. Lees, was given in the issue of the "Journal of the Society of Chemical Industry" for the 29th ult. As acetylene has now entered the field as a competitor with coal gas, our readers will doubtless be interested in reading the following reproduction of the abstract.

Phosphorus.—Lewes has found that an acetylene containing less than "80 per cent. of phosphene," part of the latter undoubtedly existing as P_2H_4, is not liable to spontaneous inflammation, even if the mixture be warmed with hot water. When generated by the "drip" system, however, the gas coming from a carbide containing 1 per cent. of calcium phosphide catches fire of itself; whereas if the carbide-to-water method be adopted, 25 per cent. of calcium phosphide is needed to produce the same effect. The highest proportion of phosphene ever met with in acetylene evolved from ordinary carbide has been returned at 2·3 per cent. (Lewes); and this gas was not spontaneously inflammable. In fact, only one case of spontaneous inflammation has been recorded, and this dated from the earliest years of carbide manufacture. None of the accidents which have happened with acetylene plants have been due to this cause. Caro has shown that crude acetylene may contain organic compounds of phosphorus, especially if a high temperature has been produced in the generator. These compounds are of a basic nature, and contain nitrogen; they may be extracted from the gas by washing with petroleum spirit.

Sulphur.—Properly made acetylene seldom contains sulphur as sulphuretted hydrogen. When the gas from a hot generator, and the spent liquor in any apparatus, does contain it, this is due to the influence of the high temperature in the first case, and to the presence of aluminium sulphide in the carbide in the second. In the absence of the aluminium sulphide, Wolff has demonstrated the existence of sulphuretted hydrogen in the gas. Here the calcium sulphide had probably been converted into calcium sulphydrate by the water; sulphuretted hydrogen being evolved from it by the action of heat. The sulphur of crude acetylene exists partly as organic compounds; the proportion being higher if the gas comes from a hot generator. Some of these bodies are soluble in ether and petroleum spirit; some insoluble. The soluble portion Caro rightly considers to consist of mustard oils; the insoluble he holds contain mercaptans. The latter are readily extracted from the gas by an acid solution of cuprous chloride, or oxidized by chromic acid. They appear to be not easily acted upon by bleaching powder. The author has examined the precipitate obtained when crude acetylene is led into mercuric chloride solution strongly acidified with hydrochloric acid. Beyond proving that the precipitate is not identical with that given by phosphoretted hydrogen, that it contains mercurous chloride, and that it evolves a gas (which is not precipitated by more mercuric chloride, nor absorbed by caustic potash) on treatment with nitric acid, he has not been able to ascertain its exact constitution. By washing crude acetylene with hot aniline, the existence of Caro's oil of mustard has been corroborated. Attempts to study the impurities by examining spent purifying materials have not been successful. All the sulphur compounds, as well as those of phosphorus, tend to give trouble at the burners, since they block up the fine holes. A proper system of purification should therefore remove both sulphur and phosphorus.

Ammonia.—Crude acetylene always contains ammonia. This may arise from aluminium or calcium nitride in the carbide. According to Lewes, the proportion of ammonia in the gas ranges from 0·16 gramme (carbide-to-water gas) to 0·95 gramme (drip generator gas) per litre. Rossel and Landriset return the variations as between *nil* and 0·4 gramme per 100 litres. Ammonia is very objectionable in the gas. It corrodes brass pipes, assists the formation of explosive acetylene-copper compounds, and, according to von Scepczynski, produces pyrrol at the burner orifices, and so stops them up.

Hydrogen Silicide.—Lewes has asserted the presence of this



PLAN OF THE HOUSE.

impurity in crude acetylene, returning its maximum proportion as 0·01 per cent. Did it exist in acetylene in appreciable quantity, hydrogen silicide would be harmful, for it is spontaneously inflammable, and would block the burners by deposition of silica.

Oxygen, nitrogen (or air), hydrogen, carbon monoxide, methane, unsaturated hydrocarbons other than acetylene itself, and saturated hydrocarbons, have all been found in crude acetylene in various amounts; but with the exception of minute quantities of nitrogen and carbon monoxide, which occur in crevices of the carbide, and of hydrogen, which may be produced by the decomposition of phosphene, these foreign bodies are formed by the action of high temperatures in the acetylene generator, or are added, as air, to the gas by a badly designed apparatus. They do not, therefore, have to be removed by methods of purification; their formation must be prevented. They are objectionable because, as diluents, they lower the illuminating power of the acetylene, or because they cause stoppages in the pipes. Experiments on the absorption of the true acetylene in crude gas by means of sulphuric acid containing 25 per cent. of sulphur trioxide, have indicated an average gaseous residue of 2 to 2·5 per cent. Of this, 80 per cent. is air, with nitrogen in some excess. Methane and hydrogen are absent; but 0·6 or 0·8 per cent. of the residue —*i.e.*, 0·015 to 0·02 per cent. of the original acetylene—consists of carbon monoxide.

For the purpose of gauging the value of the purifying materials described below, the author employed the analytical process he and Eitner have already recommended; while he also used a modification of Fischer's apparatus for estimating sulphur in coal gas. In the latter case, the gas was burnt from an acetylene bunsen under a trumpet connected with a ten-bulb condenser, the lower bulbs of which were charged with beads made of a specially hard glass capable of resisting the attack of phosphoric acid. The purifying material was placed in a glass vessel, so that a space of 500 c.c. was occupied; the quantity of substance required to fill it being 400 grammes of (2), 250 grammes of (3), 230 grammes of (4), and 360 grammes of (5). The gas was led through at a speed of 10 litres per hour, tests being made at intervals for the amount of phosphorus and sulphur escaping.

The substances which have been proposed as chemical purifiers for acetylene are five in number: (1) Ordinary ferric hydroxide as used for coal gas. (2) "Heratol," a solution of chromic acid in acetic or sulphuric acid absorbed in kieselguhr, advocated by Ullmann. (3) "Acagine," a mixture of bleaching powder with 15 per cent. of lead chromate, as recommended by Wolff; the specimen examined by the author containing 15 per cent. of barium sulphate as well, and having 16 per cent. of active chlorine. (4) "Puratylene," a mixture of bleaching powder with calcium chloride and calcium hydroxide, prepared by a special process to give it porosity; the author's sample containing 18 or 19 per cent. of active chlorine. These act by oxidizing the impurities of the gas, and by mechanically retaining the less volatile fluid impurities (tar). The last acts by decomposing the impurities. (5) "Frankoline," a solution of cuprous and ferric chloride in strong hydrochloric acid absorbed in kieselguhr, proposed by Frank. Especially for small plants, ferric oxide is practically useless; a crude acetylene containing 0·61 gramme of phosphorus and 0·27 gramme of sulphur per cubic metre still retaining 0·51 gramme of the former and 0·23 gramme of the latter after passing the purifier. Heratol is the most perfect in its action, no other substance removing the impurities so completely until it is exhausted, and no other being so rapid in its effect. A kilogramme of heratol purifies 5 cubic metres of ordinary gas, the precise amount of chromic acid present, within certain limits (110 to 136 grammes per kilogramme), being unimportant. The substance continues to purify until only some 3·6 or 3·8 per cent. of the chromic acid remains unreduced. It acts, however, upon the acetylene itself—in one experiment 13 per cent. of the chromic acid being consumed in this manner. Heratol changes in colour in the purifier; altering from its original yellow to a dirty greenish tint.

Acagine purifies about 13 cubic metres per kilogramme; but before it is exhausted it begins to allow phosphorus and sulphur to pass. In contradiction of what has been asserted, acagine does attack acetylene; the gas issuing from the purifier containing 0·2 to 0·8 gramme of chlorine per cubic metre. The amount of acetylene destroyed, however, is insignificant, and the added

chlorine hygienically unimportant. The value of the lead chromate, which is employed to retain the chlorine evolved from the bleaching powder, seems problematical, for an extraction of the spent mass with acid shows that the chromic acid of the chromate has not been reduced. A kilogramme of puratylene purifies 10 cubic metres of crude acetylene; its action (particularly as regards phosphorus) being satisfactory. It continues to act until it is practically exhausted; the spent mass only containing 2·8 per cent. of active chlorine. Puratylene attacks the acetylene itself somewhat more than acagine; the issuing gas yielding 0·15 gramme of chlorine per cubic metre. It retains ammonia perfectly, owing to the calcium chloride in it. Puratylene also begins to let phosphorus pass before it is wholly spent. All purifying materials containing bleaching powder permit the escape of sulphur compounds, but are more efficacious as regards phosphorus. Acagine, however, is but little inferior to heratol in this respect; and the quantities of sulphur so left in the gas may be considered harmless, as experience with coal gas has shown in the past. A kilogramme of frankoline removes the phosphorized impurities from 9 cubic metres of gas; but it is the least efficient of all the materials as regards the sulphur, leaving 0·20 gramme or more per cubic metre unextracted from the beginning. Still, this amount of sulphur may be held to be unimportant in practice. On the other hand, frankoline does not attack the acetylene itself; and any vapours of hydrochloric acid issuing from the purifier can be removed by chalk. Originally, it was claimed that frankoline might be regenerated by exposure to air. But this process is only available in the case of a liquid; and even there it is not complete.

Liquid purifying materials of any kind are not to be recommended, since the gas tends to pass through them in large bubbles. A solid substance also retains heavy liquid impurities. Put comparatively, the efficiency of the four materials per kilogramme may be said to be as follows: Heratol, 5000 litres; frankoline, 9000 litres; puratylene, 10,000 litres; and acagine, 13,000 litres. In practice, these numbers may be increased 10 and perhaps 20 per cent.; but assertions which have been made giving such figures as, for example, 50,000 litres of ordinary crude acetylene, must be regarded as exaggerated.

At the close of the abstract is a bibliography of the subject.

REGISTER OF PATENTS.

Conveying Hot Coke, or for other like Use.—Marshall, F. D., of Copenhagen. No. 24,579; Dec. 3, 1901.

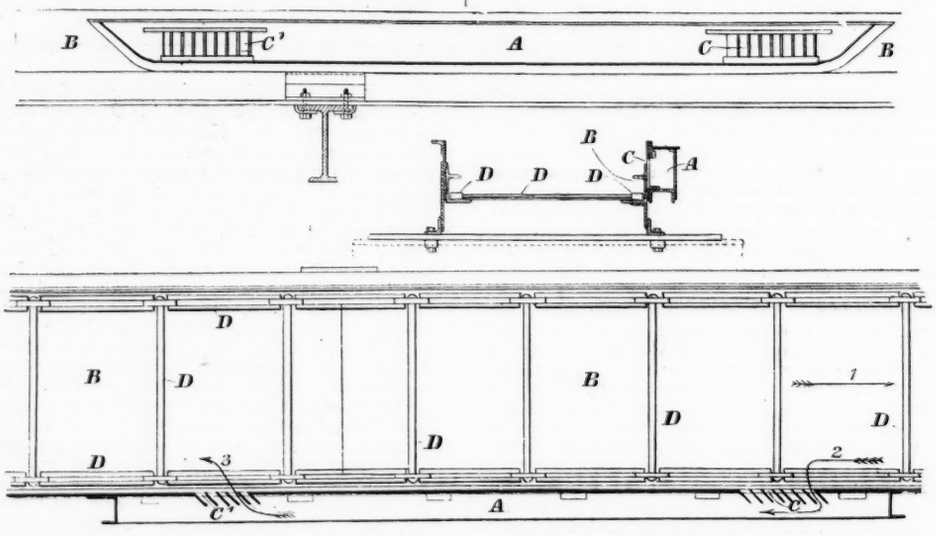
These improvements are mainly directed to the construction of the trough containing water through which the conveyor of the coke or other form of hot material which requires quenching is made to travel, and during which traverse the cooling effect takes place.

The transporter or conveyor may be of any desired type—such as chain, push-plate, continuous plate, or other convenient form—and, in the case of gas-works, the trough may be situated immediately in front of the retorts. The trough contains water sufficient to quench or partially quench the coke as it is carried along by the conveyor; but it has been found in practice (the patentee remarks) that, with the ordinary troughs in use, the coke, as it travels along the channel formed by the bed of the conveying means, has the effect of pushing in front of it the water designed for quenching purposes, piling it up in the form of a wave, and causing it to overflow the sides of the trough—thus tending to empty the trough of water immediately in rear of the batch of hot coke being pushed forward by the conveyor, and itself acting as the pusher forward of the water. This driving ahead of the water causes an extravagant consumption; and, by reason of the removal of the water, the bed of the trough is liable to be left dry and unprotected, with the result that a buckling or warping of the apparatus is induced.

To obviate these drawbacks, apparatus is constructed as shown. In this, A is the bye-pass channel, or return channel, shown as attached to the side of the conveyor-trough B. C, C¹ are openings in the side of the trough to give passage to the water, and there are inclined plates forming a grill to direct the flow of water and to arrest the coke dust and detritus. D indicates the position of the conveyor (any type, as no claim is made to the conveyor parts). To the sides of the trough are attached bye-passes or overflow boxes, or return-flow channels A, at adjusted distances apart, so as to permit of the pressure upon the water exerting itself in laterally displacing the column instead of piling it up in a wave ahead of the mass of coke being conveyed. These side-spaces permit of the water returning thereby from the front to the rear of the travelling mass of coke, and resuming its place in the trough ready for the next oncoming batch of coke; and so on, by each succeeding side-channel A, the displaced water returns to the rear by these lateral channels, and overflow is avoided.

As the conveyor is liable to leave behind in the channel B coke-dust and other detritus formed or deposited in the course of its traverse, and as such deposit might otherwise follow the water current laterally into these side channels (to the eventual impediment of their action upon accumulation occurring), the entrance openings C, C¹ are provided from the trough to the side channels or returns A, with protecting grills, louvres, or equivalent appliances arranged at such an angle that the tendency of the solid matters will be to slide past the protected openings, while the liquid flows through them. As a further precautionary measure, the bye-pass boxes or return channels are constructed with covers (one of which is shown) that can be opened at the desired places, so that any accumulation of breeze, dust, or detritus may be readily removed without interference with the operation of the main conveying apparatus or of the others of the series of bye-passes.

Supposing the coke on its conveyor to be travelling in the direction of the arrow 1, the water pressed forward by it will tend to flow into the side-channel A by the openings C, in the direction of the arrow 2; and as soon as the mass has passed that opening, the pressure in front of the mass will be relieved by the flowing of the water by way of the opening C into the bye-pass A, and out by the opening C¹ in the direction of the arrow 3, back to the trough B in rear of the mass.

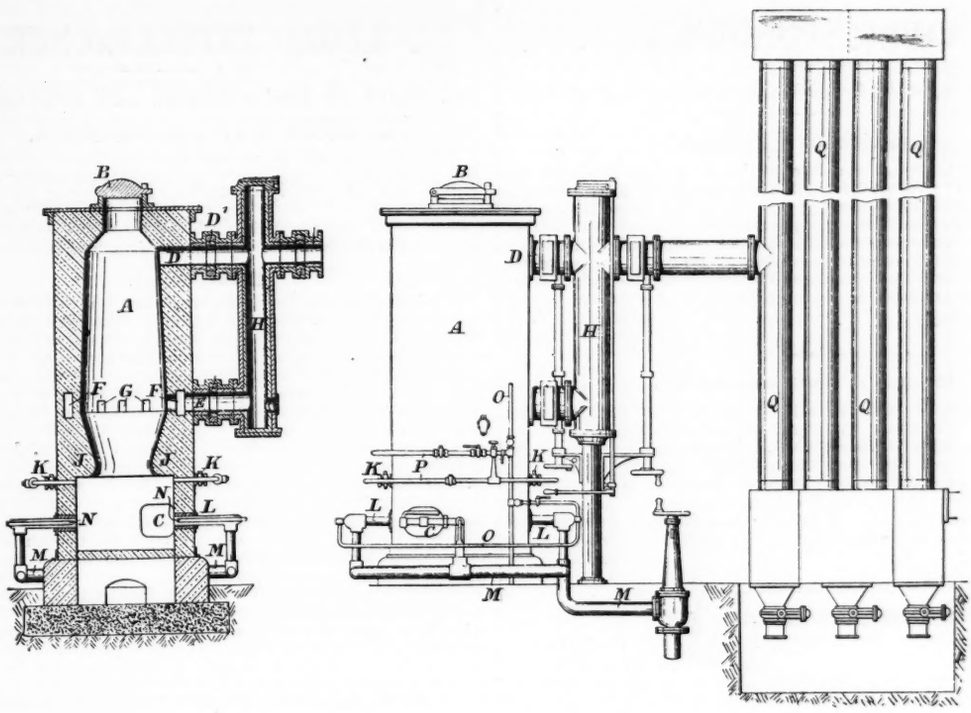


Production of Gas Suitable for Heating and Illuminating Purposes.—Tully, C. B., of Sligo, and Lewes, V. B., of Greenwich. No. 26,461; Dec. 27, 1901.

In their specification, the patentees remark: Many attempts have been made to utilize the tar arising from the destructive distillation of coal in gas-works, and the oil tar formed during the production of carburetted water gas, by converting such tars into gas either alone or in conjunction with poor coal gas, water gas, or other gaseous vehicle. Such attempts have, however, so far as we know, met with little success, owing to the formation of heavy pitch-like deposits, which, condensing in the ascension-pipes, mains, or other constricted portions of the plant, have quickly led to the choking up of the apparatus. Now, we have discovered that it is possible to entirely decompose such heavy mixtures of hydrocarbons into gas and carbon; the gas (which chiefly consists of hydrogen and methane) mixing with water gas generated at the same time, while the carbon can either be recovered as lamp-black, or can be utilized in the generator for the formation of water gas, at will.

Features in a water-gas generator in accordance with this invention are: A device by which the height of the bed of incandescent fuel is kept constant; the injection of steam through the same openings as the air blast, by which the clinker is broken up, and it is possible to work without fire-bars; and an arrangement of stack-pipe valves and tubes such that it allows of the removal of gases from the generator, either from (or near) the middle or top, and also allows of the lamp-black being either brought away with the gases and recovered, or filtered off and burnt at will.

The inventors employ a gas-generator or cupola comprising a gas-tight casing lined with fire-brick, and provided near the bottom with the necessary clinkering doors. The generator is charged with coke, anthracite, or other carbonaceous fuel, which, being ignited, can be raised to incandescence by air-blasts injected into it at suitable openings close to the bottom; the air-injectors being arranged around the circumference at a number of points, and carrying in their interiors



steam-pipes, so that, when the necessary incandescence has been obtained by the air-blast, steam may be injected direct on to the area of maximum temperature in the fuel. In a suitable position—say, about midway down the generator lining—are arranged a series of nostrils or openings leading into a flue bedded into the lining, and which, passing entirely round the generator, has its exit into a stack-pipe closed at the top by a snift-valve. A second exit from the generator is arranged close to the top of the generator, and leads into the upper portion of the stack-pipe. Both exit-pipes are fitted with valves, so that during the process of blowing the fuel up to the needed temperature the products of combustion can be led away through the nostrils in the circumference of the generator lining and a definite height of fuel kept in a condition of incandescence, while during the succeeding period of steaming the fuel and decomposing the heavy hydrocarbons, the resulting gaseous mixture can either be withdrawn by the nostrils at or about the centre of the generator or from near the top. Half-way (or thereabout) between the nostrils and the floor, there is an inward projection constituting a contraction of the internal area, which may be produced by an appropriate formation of the generator lining; and as the fuel falls through the opening left at the contracted part, it leaves below the projection a space running round the interior of the generator, into which three or more injectors are fitted at intervals for driving in the heavy hydrocarbons, tar, &c., by steam. The projection may be a part of the refractory lining, or may be constituted by a water-cooled ring of suitable form.

The accompanying illustration shows, in central vertical section, a gas-generator constructed according to this invention; also, in elevation, the generator combined with a series of atmospheric condensers.

A is the gas-generator, preferably constructed of sheet-metal and lined with fire-brick. It has a charging-valve B at the top, and clinkering-doors C near the solid hearth or bottom. There are two outlets for the emission of gas—one D near the top, and the other E about midway of the height of the generator. The latter is in communication with a flue F bedded in the lining, and communicating with the interior of the generator by nostrils or openings G. Both outlets (controlled by valves) are connected to a stack-pipe H having a snift-valve at the top and a gas exit-pipe with valve. Between the nostrils and the floor of the generator there is an inward annular projection J, constituting a contraction of the internal area of the generator lining. Below this contraction of area there are three or more injectors K, for driving in heavy hydrocarbons on to the column of incandescent fuel. L are pipes for blowing the generator by air from the blast-main M; and within each air-pipe L is a steam jet or nozzle N, for the supply of steam for the generation of water gas, and for breaking up the clinker. O is a main steam supply-pipe, and P a hydrocarbon supply-pipe. Q are air condensers to catch the lamp-black, when this is not to be burned in the generator.

The *modus operandi* is as follows: The generator having been filled with fuel to the top, the fuel is ignited and blown up to a high degree of incandescence by an air-blast admitted through the openings L at the lower part of the generator; the products escaping through the nostrils G into the stack-pipe H, and away into the outer air through the snift-valve. By this method of procedure, the lower portion of the fuel is raised to high incandescence for a definite height, and, with proper regulation of the air-blast, the escaping products will (it is said) contain but little unburnt matter; the fuel at the top of the generator being heated, but not raised to visible incandescence.

The necessary temperature having been attained, the snift-valve is closed, and tar or other heavy hydrocarbons are injected by steam through the injectors K into the annular space below the projecting refractory ledge J, or water-cooled ring; and being driven into the incandescent fuel, both are decomposed—the hydrocarbons breaking up into soot and gaseous products of decomposition, while the steam, in contact with the incandescent and nascent carbon from the decomposition, forms water gas.

At the same time that this action is proceeding, some steam is injected through the pipes N in the interior of the air-blast tubes L, and playing upon the clinker formed during the blow, breaks it up, while the steam is converted into water gas.

The various gases formed during this portion of the process pass upwards, together with the finely-divided carbon from the decomposition, which latter is filtered from the gas by the comparatively cool carbon in the upper portion of the generator, and, as the fuel gradually sinks, is brought down into the zone of combustion below the nostrils, and, on account of its fine state of division, is utilized before the larger masses of fuel in the actions taking place.

The mixture of hydrogen, carbon monoxide, and methane formed in the second period of action leave the generator at D near the top, and passing into the stack-pipe H leave it by the pipe which forms a cross junction with the upper exit from the generator, and which is closed by a valve when the snift-valve is open for blowing, but opened when the snift-valve is closed.

In places where there is a demand for lamp-black, the patentees remark that it will be found more economical to recover it than to burn it away in the generator; and this can be done by leading away the gases laden with finely-divided carbon through the nostrils G, and thence through the stack-pipe H and the same valve as before to the series of atmospheric condensers Q in which strips or tubes of asbestos are suspended, on which the carbon deposits, and from which, by some jigging arrangement, it can be shaken into a sealed receptacle.

APPLICATIONS FOR LETTERS PATENT.

27,573.—Keith, J. & G., "Anti-vibrating supports for incandescent burners." Dec. 15.
27,576.—Kershaw, A., "Gas-regulating governors." Dec. 15.
27,633.—Armanni, L., "Incandescent gas-burners." Dec. 15.
27,634.—Steilberg, R., "Bunsen gas-burners." Dec. 15.
27,736.—Hinman, C. W., "Gas lighting and heating apparatus." Dec. 16.
27,821.—Oppenheim, A., "Process for making incandescent mantles transportable." Dec. 16.
27,827-8.—Mayer, I., and Hubner, J., "Stop and automatic cut-off valves." Dec. 16.
27,836.—Jackson, W. M., "Automatically mixing or combining acetylene gas with oxygen." Dec. 17.
27,870.—Neill, G., "Gas and oil engines." Dec. 17.
27,880.—Bolton, E. J., and Walker, E., "Gas regulators or governors." Dec. 17.
27,911.—Buss, E., "Measuring the supply of liquids, gases, and vapours." Dec. 17.
27,917.—Schill, C. H., "Washing and similarly treating gas." Dec. 18.
27,918.—Hinton, E., and Andrews, F. A., "Gas taps or cocks." Dec. 18.
27,920.—Elsey, C. R., "Gas-stoves." Dec. 18.
27,922.—West, A., "Gas-stoves." Dec. 18.
27,955.—Brookes, S., "Supporting incandescent gas mantles." Dec. 18.
27,963.—Wadsworth, M., "Supporting incandescent gas mantles." Dec. 18.
27,965.—Carter, F., "Gas cooking-stove." Dec. 18.
27,986.—Otten, G. C., "Gas generating apparatus." Dec. 18.
28,039.—Morrall, J. B., "Brackets for gas." Dec. 19.
28,129.—Ryan, C., "Incandescent gas-burners." Dec. 20.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Gasholders in a Hurricane.

SIR,—A terrible storm, or rather hurricane, ravaged Denmark on Christmas night; the wind force having reached 85 miles an hour, which equals a pressure of about 35 or 36 lbs. on the square foot.

We have many gasholders in overground steel tanks round about the country, and several were quite full at the time. None suffered damage; and, curiously enough, our managers report that the holders seemed to scarcely feel the terrible blasts to which they were subjected. Little or no cast iron is employed in the construction of these holders.

Copenhagen, Dec. 26, 1902. F. D. MARSHALL.

Inclined v. Horizontal Retorts.

SIR,—Regarding Mr. Goodson's letter in the "JOURNAL" of this week, in which he compares the cost of his carbonizing at Heckmondwike with the working at Bury, before a satisfactory comparison can be made, and before I can accept the conclusions he has arrived at, it is necessary to know the various conditions prevailing at his works—viz., as to whether eight or twelve hour shifts are worked, and the rate of wages per shift per man. If Mr. Goodson will kindly supply this information, I shall be pleased to go further into the matter with him.

Manchester, Dec. 26, 1902. JOHN WEST.

The Hoddesden Gasholder Tank.

SIR,—In your comments on this case, you say surely I "would not contend that the contractors having proceeded with the work under the changed conditions the obligations were not continued on their side—chief among which were the soundness of the tank, and the finishing of the work to the satisfaction of the Engineer." The best answer I can give is to say how I should have acted under such circumstances.

I assume the Engineer was informed that the soil was solid clay; and, that being so, if I had been in his place I should have invited contractors to tender for the tank, telling them in the specification and showing by the drawings—as was done in this case—that it was to be built in an impervious clay soil, and I should have expected them to believe me, and to tender at a low price for what is perhaps the easiest and simplest work that falls to the lot of the gas engineer. It is only so many yards of clay to be excavated and so many rods of brickwork to be built, with no risk of any kind—the usual clause about soundness being absolute surplusage for which the contractor should not add anything.

It turns out that I have been misled. Everybody believed the soil was clay, and the contractor finds gravel. The character of the work has entirely changed from being one of the easiest, it has become one of the most difficult and uncertain in gas engineering. What is to be done? Is it right that the contractor should bear the consequences of the mistake of his employer? Is he to put in such extra work at the schedule of prices named in the tender, and in addition be held responsible for water-tightness—a risk he never contemplated, and for which he charged nothing in his tender? If so, the company will get their tank at a considerably lower price than they would have had to pay had they not misinformed and misled the contractor. This may be law, though I doubt it, little as is my respect for many of the contentions of lawyers; but it certainly is not justice.

In such cases (and I have had some of the kind), my course would be to say to the contractor that I could not hold him to his contract, and to ask him for what additional sum he will do the additional work and take the risk of making the tank sound; or what he will charge for such extra work as I may order without taking the risk—the responsibility for the success of such work resting with me. If the difference should be slight, I should adopt the former; but if considerable the latter plan.

It seems that in the Hoddesdon case there was a misunderstanding on both sides—the Gas Company thinking that, even under the totally altered conditions, the risk was still with the Contractor, while he took the opposite view; and only after the work was very far advanced was the question raised. Then came the dispute that ended in the Law Courts. I cannot but think that the Contractor was unfairly treated, though not intentionally, by the Gas Company. The settlement was greatly in their favour; for they have got the tank at considerably under cost price. Their leading Counsel, who had taken no part in the case in Court, settled the figure with the opposite Counsel without consulting his client, who, if litigiously disposed, might, I imagine, repudiate it and have another trial. The original tender was £1380. Of this £1000 had been paid. Mr. Docwra's further claim was £1775; and £700 was paid into Court. The case was settled for £500—or only £120 over the original tender, though I believe it is admitted that something more is to be paid.

For 35 years I have known and had extensive dealings with Messrs. Docwra—with the founder of the firm, the late Thomas Docwra, and with Mr. John, the late head, who has just retired. There has never been the slightest dispute; and every contract has been most honourably fulfilled. Never have they hesitated to fulfil all their obligations, whatever the cost to themselves.

Dec. 27, 1902. GEORGE LIVESEY.

The Skegness Gas Company have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for a new gasholder and steel tank and purifying plant. The work is being carried out under the supervision of Mr. E. J. Brockway, of Cleethorpes, the Company's Consulting Engineer.

LEGAL INTELLIGENCE.

THE CLAIM IN THE AUSTRIAN LAW COURTS AGAINST BARON AUER VON WELSBACH.

In last Tuesday's "JOURNAL" (pp. 1700-02), we reported the proceedings in this case which took place in the Commercial Branch of the Vienna Law Courts on the 9th inst. At the end of that sitting, it will be remembered, the matter was adjourned to the following Friday.

Friday, Dec. 12.

The first witness called to-day was Herr Th. Friedmann, formerly cashier to the firm of Lindheim, and now chief clerk to Angerer and Co. The President asked him to state the facts as to Herr Kuschenitz having shown him the new light before February, 1891.

Witness: As cashier to Lindheim's, in 1890, I made the acquaintance of Herr Kuschenitz, Dr. Auer's Secretary, who came every week to go through the accounts for fluid. We made friends, and met away from the office. On one occasion he told me that I should influence Herr Zwiklitz, a member of the firm of Lindheim, with whom I was on good terms, not to sell the Auer patents, the sale of which was already being negotiated at that time. He gave me only the intimation then, and no further particulars. That was in the winter of 1890-1. Some weeks later, Herr Kuschenitz invited me into his house, which adjoined Auer's laboratory, and said: "I will now show you something." He took me to another room, and lighted up some of a number of mantles on a bench—chiefly, I think, to give light, as none were alight when we entered. He then lighted another burner, which was detached from the others, and which, in contrast to them, gave a marvellous light, as I often saw later. He talked of the great illuminating power of the new light, how many candles intensity it might be, and how it could be measured. A short time previously the firm of Lindheim, being dissatisfied with the old fluid, had been offered a new fluid, designated "thorium fluid," costing £5 instead of £3 10s. sterling per kilogramme. When I saw the new experimental lamp, I said: "Ah, that is certainly made from the new thorium fluid at £5." Herr Kuschenitz asked me to do nothing further in regard to what I had seen, as it was still being kept secret. The offer of thorium fluid to Lindheim's was no secret, as it had been made officially.

The President: Was that the new Auer light?

Witness: I do not know. I thought it was made from the new fluid, which had come to be tested.

The President: Was nothing further said in the laboratory on that occasion?

Witness: I said that it would not pay, as the fluid was too dear; and Kuschenitz did not reply.

The President: What was the interval between the offer to Lindheim's and your visit to the workshop?

Witness: There cannot have been a long interval, as it was before the sale of the patents in February, 1891.

The President: Why did Herr Kuschenitz ask that his communication should be kept secret, if it was no secret?

Witness: I can only suppose that he had in mind our joining partnership for exploiting the new invention in some way ourselves. But it is also possible the mantle in question was not made of the thorium fluid, but of some fluid unknown up to that time.

The President: Did you report on it to Herr Zwiklitz (of the firm of Lindheim)?

Witness: Yes; I advised him not to sell the Auer patents. But a year later he became insane; and the firm had acquired so great a prejudice against the Auer light that they parted with the patents.

The President: You have made a declaration before a Commissioner?

Witness: I met Herr Rund in the summer of 1900 in the Restaurant Gause; and we spoke of old times, and then of the Auer light, and I related all that I have just stated. He asked me to write down the dates, and I did so; and he then inquired if I would tell Herr Oesterreicher as well, and whether I would make a declaration before a Commissioner. I said: "Certainly; for it is the truth." Some days afterwards, I was invited to the chambers of Dr. Sternlicht, to whom I narrated all; and he made notes. An information was not taken. The patents were still in the possession of Lindheims when I saw the new burner.

Dr. Elbogen: Was the light which you saw white, like the present Auer light?

Witness: It was white. I do not know whether it was identical with the present light.

Dr. Gallia: Do you know what the first fluid was called?

Witness: Fluid.

The President: Not "lighting fluid"?

Witness: No; therefore the name of the second fluid offered to us—thorium fluid—surprised us. It was dearer; and the Lindheims objected to the higher price.

Dr. Gallia: Was a third fluid offered to you under the name of "new thorium fluid"?

Witness: I know nothing of that.

Dr. Gallia produced a letter written by the witness for Lindheims, on Feb. 5, 1891, in which Herr Haitinger was asked to treat with the firm for his new light. Witness was asked whether the light he had seen might possibly have been the yellowish-red Haitinger light.

Witness: No; the light was white, like the electric arc light. I am sure it was white; and though I am not strictly a technical man, I have controlled the factory work. I have worked with Rund on a guide-book which he has published. I am not on good terms with him, and only greet him when we meet.

The President read a letter from witness to Herr Oesterreicher, saying that Dr. Auer was making mantles from an incandescing material which was still kept a secret; but witness did not know of this letter. Dr. Elbogen produced the notes given by Herr Friedmann to Herr

Rund three years ago; and witness remarked that some of them were only signed by him. In one it ran: "Kuschenitz said: Friedmann, if you are sensible, we two might take this new thing in hand." And in another: "It is a new light, which Auer has discovered; but it is still kept secret."

Dr. Gallia: There was at that time, besides the greenish incandescent gas-light, also a white one; but this was not durable. I would call, in case of doubt, Herr Pintsch, one of the leading gas experts in the world, who happens to be in Vienna now.

Dr. Elbogen (to witness): You say, in the notes, that you were puzzled when you saw the new light?

Witness: Yes.

Dr. Elbogen: The light which you saw then resembled the present one?

Witness: Yes.

Herr Felix Kuschenitz, Manager of the Incandescent Gas-Light Company, was the next witness. He stated that Herr Friedmann had, on one occasion, visited him at his house. It was in the evening; and he lighted a table lamp, and also one mounted on a photometric pillar, no doubt a Haitinger burner. He could not remember anything else, as it was more than ten years ago.

The President: Did you tell Friedmann to advise Herr Zwiklitz, of Lindheims, not to sell the patents?

Witness: I cannot remember; but there was no occasion to say so.

The President: Would it not disturb the photometric testing if the burner was used for domestic purposes?

Witness: It was not a burner for testing purposes, but merely one for private use mounted on a photometric pillar.

The President: Herr Friedmann says that you lighted three lamps, and the fourth, which stood apart, gave a particularly bright light, with the new thorium fluid?

Witness: There was no new thorium fluid at that time; but it is possible that the burner had the old fluid with an addition of thorium, as was then sold. I had also numerous Haitinger burners.

The President: Friedmann states that the fourth lamp burnt like a star beside a night light?

Witness: That can only have been the Haitinger light. I had higher gas pressure for experiments; and all gas-burners did better with me than elsewhere.

The President: You must have requested Friedmann to keep secrecy.

Witness: I had no reason to do so, and it is not in agreement with the facts.

The President: There is a contradiction in this. On the one hand, you must have requested Friedmann to be discreet, and advised him to warn Zwiklitz before the patents were sold; and, on the other hand, you must have intended to take the matter in hand with him. Regarded from the point of view of human egoism, the second version is the more probable. If you were so indiscreet as to divulge a secret of your master's, you would not have done so for Lindheim's advantage, but rather for your own. When did you see the new light, as now in use, burning for the first time?

Witness: I first saw the mantles in August, 1891; Herr Auer told me nothing of it earlier.

The President: Mr. Williams has told us how in the middle of July he was sent to America, in order to procure large quantities of monazite sand for the production of a new light; and Dr. Gallia has told us that Auer first started recovering large quantities of thorium from monazite sand after the patent had been applied for in August. The question, then, is whether you saw mantles of the present chemical composition before June 23, 1891?

Witness: No; there were many mantles, of different chemical compounds, tested, and these experiments led to the subsequent inventions. I know that on Nov. 3, 1891, I received the first half-kilogramme of the new fluid from Baron Auer at Atzgersdorf, and brought it to the factory in the Schleifmühlgasse. On Nov. 4, the installation of the new light in the Café Opéra was started.

Dr. Elbogen put before the witness what Friedmann had said; and witness expressed his doubt as to most of the utterances that were attributed to him.

The two witnesses, Herren Tischler and Sattler, who had been warned at the last sitting to give evidence to-day under pain of a fine of 500 kronen in the event of refusal, were next called. Dr. Gallia made a declaration, by Baron Auer's authority, that both these gentlemen were absolved by Baron Auer from any obligation to him of secrecy. Herr Tischler demurred to this declaration, and said that only Baron Auer himself could absolve him from his obligation of secrecy as Patent Adviser. He asked the Court to say if the declaration of the plaintiff's Counsel must suffice him; but the Court declined to decide the point. The witness Tischler then refused to give evidence; and the Court imposed on him the fine of 500 kronen, and threatened him with a week's imprisonment if he still refused to give evidence at the next sitting of the Court. The witness Sattler declared that neither Dr. Gallia nor Baron Auer could absolve him from his obligation of secrecy, as he was under agreement, as Chief Clerk of the firm of Welsbach and Williams, Limited, to keep secrecy for all time, under penalty of a heavy forfeiture. He pointed out that the firm comprised many members to whom he was bound to absolute secrecy under the agreement.

Dr. Gallia: The firm of Welsbach and Williams has not been in existence for some time; it went into liquidation years ago. Moreover, I would telegraph to London and Paris, if desired, to Herr Littlejohn, the Liquidator of the Company, to obtain his permission for you to give evidence. But I can state that Baron Auer, as proprietor and chief of this Company and of the firm, can free you from every obligation.

Dr. Elbogen pointed out to the witness that the penalty imposed by the agreement could not be enforced in the case of evidence given under compulsion, and that the decision of the Court removed every ground of excuse.

Herr Sattler stated that he would not give evidence except under extreme coercion; and he was thereupon fined 500 kronen, and threatened with a week's imprisonment if he still refused to answer at the next sitting of the Court.

Dr. Elbogen then brought forward a proposition of fresh evidence, stating that the question to be decided in the action was concentrated in the inquiry whether Dr. Auer had his new lighting fluid, consisting of 99 per cent. of thoria and 1 per cent. of ceria, before June 23 or not. He therefore asked permission to call, as a witness, Herr Moeller, formerly General Manager, and Chairman of the Board, of the Incandescent Gas-Light Company, who was now in London, and had—and was bound to have—complete knowledge of the existence of the fluid in question.

The President: It is regrettable that the evidence is proposed by stages.

Dr. Gallia: The case would never end if the defendant's representatives had their way. Herr Moeller was never engaged at Baron Auer's; he was not his officer, and has never been in his laboratory. There are many persons who stand in relations similar to Herr Moeller in regard to the Company, and yet would be as little concerned as he about its experiments. Baron Auer, who, as an inventor, was very distrustful, did not let his own people into his secrets, much less third persons. How, then, could Herr Moeller, who was with the (Incandescent) Gas-Light Company in London, and often travelling, give information? It was superfluous to summon him. But if he could be present by the 19th—the next sitting of the Court—he (Dr. Gallia) had no objection to his being called.

Dr. Elbogen: I hope he will be able to be here.

Dr. Gallia: But it is impossible for you to raise any evidence; the facts are against you. I make it a counter condition, that, if Herr Moeller is not here on the 19th inst., the case shall be pursued without him.

In reply to the President, Dr. Elbogen said that Herr Moeller's travelling expenses from London would be settled at once. The President asked if Dr. Elbogen had anything further to bring forward; and he replied that only an expert could answer the all-important question, which cropped up at every turn, as to when an invention was complete. There was the further question as to when an invention was so far completed that it was capable of being realized in working on the large scale. Only a chemist and a technologist could satisfactorily answer this question also. There had seldom been a case involving so important, vital, and far-reaching questions; and there would be a gap in the train of evidence if an independent expert were not called in. He proposed, therefore, that such an expert should be examined.

Dr. Gallia: It has been established that the mantles in question were burnt for the first time in August, 1891. My statements, and those of Herren Kuschenitz and Haitinger, which could not be controverted by Friedmann's statements, have proved that. Therefore no expert is wanted, as he could only answer general questions, and not as to the concrete case.

The Court deliberated for a short time, and then declined to receive all the proposed evidence, with the exception of that of Herren Tischler and Sattler, or of the two parties to the suit.

The hearing was adjourned to the 19th inst.

Friday, Dec. 19.

The President: The defendant's Counsel desires to speak with regard to submitting some new evidence.

Dr. Elbogen: I have taken advantage of the short time which has elapsed since the last hearing to go to London, and have had some conversation there with the former Chairman of the Austrian Incandescent Gas-Light Company, Herr J. Moeller, and others. While I did not succeed in getting Herr Moeller to come to Vienna, I have brought back with me so much original matter that I can assert that it will ensure that the truth will triumph. In the "Journal of Gas Lighting" for the 9th of December last, a circular has been printed, which was sent out in December, 1891, by the General Manager of the Welsbach Company to gas companies and all concerned. In this circular, there are tables giving photometric results with the new light, from which it follows that a burner was lighted on the 15th of April, 1891, burnt day and night for 2800 hours, and then still afforded 45-candle power. Another burner was lighted on May 30, 1891, burnt for 3000 hours, and still afforded at the expiration of that period 65-candle power. I appeal to the Court. I am obliged to repeat my request that the evidence of Herr Moeller may be received, and also that of Mr. De Fonblanque, who for many years was the Secretary to the English Company. Both are in London. Herr Moeller handed me, three days ago, the following document, which he signed, after he had dictated it to his Secretary.

Replies of Julius Moeller to Questions put by Dr. Elbogen in London on Dec. 16, 1902.

In the "Journal of Gas Lighting" for the 9th of December, page 1557, is a reprint of a circular, signed "J. Moeller," sent out by the Incandescent Gas-Light Company, Limited. Can you recollect this circular?—Yes; the circular was sent out then to all the gas companies in Great Britain, and I vouch for its contents being in agreement with those of the original.

Were the photometric tests recorded in the circular carried out by you on the new incandescent mantle?—No. These durability tests were made by Herr Felix Kuschenitz, then Private Secretary to Dr. von Auer, and were handed to me by Herr Kuschenitz personally in Vienna in the latter half of 1891; and I then saw the burners, which, according to Herr Kuschenitz's statement, had burnt through those periods.

Have you any doubt whatever as to the correctness of these statements?—None whatever. Herr Kuschenitz could have had no cause to make an erroneous statement. These data were handed to me on the understanding that I could use them freely for publication; but that I was not, however, to publish the source of the tests.

Under what conditions did the English Company get this invention?—By agreements with Dr. Auer von Welsbach, all further new inventions in incandescent gas lighting were secured gratis to the English Company; and in the second half of the month of July, 1891, Mr. Fred Williams brought news from Vienna that Dr. Auer had made

a fresh invention, and proposed to make over this invention to the English Company on certain conditions. These conditions were discussed at length, and finally embodied in an agreement made between Dr. Auer and the English Company, and which was signed by the English Company on Aug. 8, 1891.

Was the invention made over to you by this agreement?—No. In this agreement Dr. Auer undertook to deliver 1000 kilogrammes of lighting fluid, which was required for working the invention, at a price of £5 sterling per kilogramme (2·2 lbs.), and to guarantee its quality. Dr. Auer also fixed what was a very high candle power for that time, under a guarantee that a mantle must maintain this candle power for 1000 burning hours, *plus* or *minus* 10 per cent.

Has this guarantee been substantiated in practice by the mantles?—At first, certainly. The quality of the fluid delivered at first was as stipulated in the agreement.

Did Mr. Williams give any explanations at all with regard to the length of life of the mantles?—Yes. Mr. Williams in due course stated that mantles of this new lighting fluid had burnt for 1800 to 2000 hours without diminution of light. Directly on that, and on the demonstration with mantles brought over by Mr. Williams, which were burnt off before Admiral Sir Edward Inglefield, Major Charles Jones, Mr. De Fonblanque, and Julius Moeller, and the enormous illuminating power of the new light shown, the Board of the English Company came to a decision; and the agreement of Aug. 8 was consented to, and the conditions propounded by Herr Auer were accepted.

How and when was the illuminating power of the new fluid demonstrated to the gentlemen in question?—When Mr. Williams came back at the end of July, he brought with him three to five unburnt-off but impregnated mantles. These were shaped by a girl on the first floor of the old factory, No. 14, Palmer Street, and burnt off; and they lighted up with an intensely white light. (Signed) JUL. MOELLER.

London, Dec. 16, 1902.

Dr. Elbogen: There was thus an agreement made on Aug. 8, 1891, with the Welsbach Company in London about a new mantle, for which a burning term of 1000 hours and a power of 65 candles were guaranteed.

Dr. Gallia: Have you the agreement?

Dr. Elbogen: You have it; and it would be *bonâ fide* if you would produce it!

Dr. Gallia: I haven't it, or I would produce it.

Dr. Elbogen: From Moeller's document and other communications, it is evident that Mr. Fred Williams went, in May, 1891, from America to London, came to Vienna in June, and in July presented new unburnt-off impregnated mantles of the new invention to the London Welsbach Company. It is also of interest that, in May, 1891, and therefore at the time when the new mantles were already burning, Dr. Gallia endeavoured to induce the English Company to strike out of the agreement the clause which put Auer under the obligation to make over all new improvements and alterations to the Company. He endeavoured in vain. Mr. Fred Williams was authorized to guarantee the burning term of the new light, and concluded the agreement on Aug. 8. He had, however, previously looked personally in Vienna into the photometric tables of Herr Kuschenitz, the Manager, and verified for himself the photometric record. Herr Moeller is prepared to swear to all that, because it is the truth. The case is now extremely simple. Assuming that the new mantles were shown in London on July 31, 1891, Mr. Williams must have got them handed over to him on July 28 at least.

The President: It would, however, be better to prove that through Mr. Williams.

Dr. Elbogen: But Mr. Williams also is now in London. From what has been said, however, it follows that the burning of the new light must have begun on June 16 at least.

Dr. Elbogen then read from a trade paper for gas and water concerns a patent specification of Baron Auer's of the year 1891, in which it was stated that his new light afforded 1000 burning hours; and thus was distinguished from the earlier lights. Dr. Elbogen further proposed that the evidence should be taken of Herr Mohrstedt, a gas technician and trade man, who was alleged, just like Friedmann, to have seen the test burners of the new light burning in Auer's laboratory prior to June, 1891. He then read a confidential opinion of Professor Klandy, in which it was stated that some months at least were required for experimenting on the new Auer light. Finally, he asked for the witnesses Tischler and Sattler, who were to have been asked whether they had seen the new light before the 23rd of June, to be relieved of this question, and instead to be asked the question what they knew, before June 23, 1891, of the new invention. Dr. Elbogen begged for the London evidence to be admitted, as it would be a fountain of truth.

Dr. Gallia opposed all these propositions of evidence. He said: It is precisely as much in our interest, as that of the other side, that the truth should be elicited. We should be in a position to get at the truth in a very short time. I would to that end ask that Baron Auer himself should be heard. As to the witness Mohrstedt, I ask for the proposal to hear his evidence to be refused, not only because he is connected with neither the Incandescent Gas-Light Company, nor Baron Auer, nor any officer, but on other grounds also.

Counsel read letters from Herr Mohrstedt of the 9th of December to Dr. Gallia and Baron Auer, in which he put down the statements of Dr. Gallia and Herr Kuschenitz as false, and signified that he would place himself at the disposal of Herr Rund as a witness, and remind that gentleman that Herr Kuschenitz had, in February, 1891, had the new light lit up in his presence also, in the Theresianumgasse. On the 13th of December this year, Baron Auer received an account from Mohrstedt for 200 kronen [= about £8 4s.] for a manuscript sent in to him on the 2nd of August. There was a postscript to the account to the effect: As the Baron has not responded to the request made for the return of the manuscript, I must assume that the account for it is wanted.

Dr. Gallia: As Baron Auer has no dealings in manuscripts, the relation it has with these letters can be imagined. This gentleman is now portrayed as a champion in technical gas matters and an expert. Yes, indeed, on his visiting cards; but otherwise he only launched forth articles against Baron Auer in the "Floridsdorfer Zeitung" and in the "Hausherrnzeitung." This gentleman, on the 2nd of August last, sent Baron Auer an article, which was destined for the "Floridsdorfer Zeitung," with a letter in which he said that he did not want to publish the article before it had been seen by the Baron, and before he knew whether the statements in the article were in accord with the truth. Then he presses for an answer to his letter; and when this is fruitless, he forwards the account. Finally, I must still mention that he once wrote in the "Floridsdorfer Zeitung" that the Kaiser had caused the Auer osmium lamp to be removed from his writing table. This notice passed into German papers; and when the German Auer Company corrected it, Mohrstedt explained that he had received the news from an authentic source—viz., the Commandant of the Castle Lissel. Commandant Lissel explained, in answer to a question addressed to him on our behalf, that a Herr Mohrstedt was quite unknown to him, and that he had not said anything of the kind to anyone, as, in fact, the osmium lamp was still to be found to this day in that position. For the rest, Herr Mohrstedt has telephoned only yesterday: "In my absence, a gentleman with a portfolio has called on me. Did he come from your chambers?" And when he was answered in the negative, he said: "Then he must have come from Herr Rund."

Dr. Gallia explained, with regard to the opinion of Professor Klandy, that it could only have been given on the basis of one-sided and incorrect information. He had not the least objection to the amplification of the question to Herren Tischler and Sattler.

Dr. Gallia considered it remarkable that every possible hindrance was offered to the examination of Baron Auer, while alleging great eagerness in the quest for the truth. "I cannot," said the Counsel, "divest myself of the impression that a load would fall from Herr Rund's mind, if Baron Auer were not to be examined. It is only desired that he shall not give evidence here, as I have before me a decree of the District Court of Wieden, by which the Baron is summoned for to-morrow at 12 o'clock noon as a witness to make declaration whether, prior to June 23, he was in possession of those improvements which have constituted the Auer light of the present day. But here everything possible is being done to prevent Baron Auer making declaration. It is obviously frivolous to wish and to strive that a man is not to explain on oath before the Commercial Courts on the 19th that he first made his invention after June 23, 1891, and to wish to allow him to swear to the same thing before the District Court on the 20th. Pure and honourable motives could not dictate such procedure! The proceedings in the District Court of Wieden turn on the assertion that Herr Rund gave his consent to his financier Oesterreicher dissolving the patent agreement with Auer, while Herr Rund declares that he has not given it, and that Herr Oesterreicher is liable to compensate him." With regard to the London evidence, he asked for it to be refused, as the inventor could give the best information about an invention.

The President: Do you concede that the photometric measurements which were published are correct?

Dr. Gallia: I must contest them; they are certainly incomplete.

The President: Is it granted that the statements in the circular with reference to the burning term and the illuminating power of the burners offered are correct?

Dr. Gallia: I absolutely cannot admit that; the circular does not refer to the invention of the present Auer light, but to an antecedent invention, which led up to the present light. The burners which were then tested were not the present incandescent gas-light; they did not consist of 99 per cent. of absolutely pure thoria, and 1 per cent. of ceria, but were mixed also with other earths and substances.

The President: The question is whether the chemical composition was not on the whole the same?

Dr. Gallia: No.

The President: How did Mr. Moeller at that time get possession of the record of the measurements?

Dr. Gallia: I do not know.

The President: They are not, however, the outcome of the imagination of an official of the English Company; they must have originated from authentic sources? Do you grant that, Dr. Gallia?

Dr. Gallia: I cannot admit anything. (The defendant laughed aloud. The President denounced this.)

Dr. Gallia: Baron Auer says the measurements are not correct; the figures assigned do not refer to the candle power, but are ratios.

The plaintiff's Counsel once more described the manner in which Baron Auer achieved the invention of the present light, and stated decidedly that the light recommended in the circular produced by Dr. Elbogen was not identical with the light invented in August, 1891. Baron Auer had discovered a new light, but could not find by analysis in what its illuminating power existed. Mr. Moeller offered this new light in order to do business; he brought forward data of mantles which were not yet extant. All that could be explained by Baron Auer, if he were examined. Mr. Moeller was not a technical man, but a business man.

Dr. Elbogen: That has not been asserted.

The President: No; I should like to know whether an agreement was concluded in which 1000 hours burning was guaranteed?

Dr. Gallia: Certainly. That was an agreement which already referred to the new invention. However, I do not think that Baron Auer gave a guarantee for the term they would burn. I have not drawn up the agreement.

The President: Perhaps you will ask Baron Auer?

Dr. Gallia questioned the Baron, who was sitting beside him; but the latter declared that he did not remember such an agreement.

Dr. Gallia spoke against the examination of Mr. Moeller and his Secretary, of whose character he would like to be assured. Dr. Elbogen retorted; and

The President said: I regard it as out of place to utter criticisms of witnesses; that should only be done with statements which have been made. I think it best not to speak on the subject. Perhaps Baron Auer will see whether he can find the agreement at his house.

Baron Auer went away, and brought back the agreement with him.

Dr. Gallia: Once more I make the proposition for Baron Auer to be examined. Baron Auer is the expert *par excellence* in this matter; and

it would be most strange if this expert were not allowed to make a statement. Before the High Court comes to a decision as to whether the evidence proposed by Dr. Elbogen is to be received, I should like to ask that Baron Auer may be examined as to whether the assumption of the other side that the mantle was burning on April 25, 1891, is false, and not in accordance with the facts, so far as it refers to the composition of this mantle being the same as that which was invented in August, 1891, and which is at the present time on the market.

Dr. Elbogen: As regards the examination proposed by the plaintiff's Counsel, I would remark that section 771 of the Rules of Procedure lays down that the examination of the parties to an action is only to be taken as subsidiary evidence if it is found that other evidence is wanting, which is not the case in this instance.

Dr. Gallia repeated his proposal, and remarked that if Professor Klandy had been aware of the explanations which had been offered that day, he certainly would not have framed his opinion so one-sidedly.

The Court retired to come to a decision on the evidence proposed.

The Court subsequently declined to hear the London witnesses Moeller and De Fonblanque, and rejected the other proposals of evidence made on behalf of the defendant; abandoned the examination of the Patent Agents Tischler and Sattler, who had refused to give evidence at former sittings and had been fined for their refusal; and decided to examine only the plaintiff Baron Auer.

An Important Document.

The President requested the sworn Law-Courts Translator, Dr. Edmund Weissel, to undertake the translation of the original English agreement of Aug. 8, 1891, which Baron Auer had found at his house and brought to the Court.

Dr. Gallia remarked that this agreement, which he then saw for the first time, would alter the whole aspect of the case, as it gave striking proof that at the time it was concluded the new invention of Baron Auer had not been made.

Dr. Weissel then read the text of the agreement* which was made on Aug. 8, 1891, between Professor Dr. Auer and the "Gas-Light Company, Limited." The most noteworthy passages ran thus—

In consideration of Dr. v. Auer having recently discovered certain improvements in connection with the incandescent gas-light, and of the value of the patents having been very much increased by the discovery, in respect of the quality of the light and the burning term of the mantles, and having regard, moreover, to the new improvement being at present only partially completed, and that the Company desires that the said improvements should be carried to completion, so that it should derive the full advantage from them, and an adequate supply of fluid being required for this object, the Company has agreed with Dr. v. Auer as follows:—

Auer is to undertake the experiments and operations for the completion of the new process or improvement, and then deliver to the Company, within sixteen months, 1000 kilogrammes of fluid at the price of five pounds sterling; he is to deliver within three months one kilogramme of the said fluid in order that trials may be made with it. Auer is to guarantee that the mantles impregnated with the new fluid yield, with the use of 3 feet of ordinary coal gas per hour, a light of 80-candle power, *plus* or *minus* 10 per cent., after it has been burning for a period of 1000 hours. Further, Dr. v. Auer is within sixteen months, according to the best of his ability, to teach every detail of the new process to the Chemist of the Company. Finally, by this agreement, certain provisions of earlier agreements, by which Dr. v. Auer is freed from other obligations and claims, are not to be affected.

The agreement is signed by the Directors Charles Jones and Fred Williams, the Secretary, Mr. Moeller, and Dr. Auer v. Welsbach.

It was after the reading of the agreement that the President announced that the Court had decided to decline the evidence proposed by Dr. Elbogen, and to examine only Dr. Auer.

Baron Auer's Evidence.

The President pointed out to the plaintiff that, as one of the parties to the suit, he would, in giving evidence, have to keep to the truth, as he would perhaps be sworn subsequently.

Dr. Carl Baron von Auer Welsbach stated that he was 44 years old, a chemist, and a landed proprietor at Rastenfeld, in Carinthia.

The President: You know, Baron, what the dispute is about. The defendant maintains that you were under obligation to communicate your invention to him prior to June 23, 1891. Your Counsel says that at that time the invention had not been made, and therefore the communication could not take place. Will you tell us also whether your invention was an accident or is due to a concerted plan.

Baron Auer: I beg to produce the original documents in which I recorded my experiments and entered exactly every new research. They embody the history of my invention—the analytical data and photometric measurements. I will base my statement on these records. Baron Auer then began to make his statement, which occupied nearly an hour. He said: The question in this action as to when the invention of the thoria-ceria incandescent light was completed cannot be answered correctly by anyone in the world but me. I will answer it before this Court. You shall hear the entire truth. I will speak not only as if before a Court of Justice, but also as an investigator before the forum of science and research. I declare then that the invention of the new thoria-ceria mantle was not, according to my firm conviction, known, either in the technical or in the scientific sense, at the time of the repurchase—which was forced upon me—of my older incandescent gas-light patent rights, and that at that time there had never yet been a mantle of the composition of 99 per cent. of completely pure thorium oxide and 1 per cent. of pure cerium oxide. I will proceed to confirm this statement in detail. In order to make these details more readily intelligible to non-technical persons, I may describe in detail the situation at the beginning of my labours on the incandescent gas-light. At that time, it was known that pure thorium oxide—pure as understood at that time—(*i.e.*, the thoria earth of the older School of Chemistry) when heated in a hot flame, lighted up with a white light and vivid resplendence. It was also known that thorium oxide, as an admixture, affected the light-emitting power of my mantles in a high degree; that I knew a composition which, in addition to zircon-lanthana and cerium oxide, contained thorium oxide, and afforded a dazzling white light, which, however, did not remain constant long, and after a short time became fainter. It almost recalled the present light; but unfortunately it fell off. Maybe this observation suggested to me the idea of devoting renewed study to thorium, of the elementary nature of which I had doubts by reason of some observations made previously. An accident favoured this purpose. Among the preparations which I had taken over from the firm of Welsbach and Williams were some crude thorium preparations. They probably originated from the working up of a monazite sand, which contained very many—60, I think—different minerals. My first efforts were directed to discovering a certain crystallization process, by the aid of which the working up of the crude thorium salts would be easily accomplished. I discovered such a process. And thus, by the use of this process, there were gradually produced from the crude products a series of fractions. The process appeared to render the thorium fractions pure so rapidly that I ventured to hope then that I should, by this method, gain a revelation as to the elementary nature or homogeneity of this interesting body. In similar work, it was always my habit to test the oxides of the several fractions—the refractory residue—as to their quality of emitting light.

The President: Could you not explain to us what fractions are?

Baron Auer: By fractions, I mean the portions of the whole quantity obtained by a series of combustions. I tested, therefore, the several fractions; and to my huge surprise, the peculiar phenomenon appeared of the power of light emission of the oxides of the fractions of one series of crystals being extraordinarily different. Still influenced by the successful decomposition of didymium into its elements, which I accomplished about the middle of the eighties, this phenomenon struck me as a clue to the decomposition of thorium into several components to be brought about through the crystallization process. The progress of the process of separation afforded day by day a more interesting picture. The oxides from the mother liquor of the fractions standing about the middle of the series, afforded the most intense light; so that it appeared as though the peculiar light-giving body had accumulated in them. Mother liquor is the liquid from which the crystals have been obtained. In these crystal-fractions, foreign substances could no longer be definitely detected by chemical reactions; and they could therefore contain only salts of elements similar to thorium. The terminal fractions contained various foreign bodies, among which ceria was, strangely enough, present in comparative abundance. This observation led me to think that ceria oxide was also contained in the purer mother liquors; and so I endeavoured to ascertain the effect which cerium oxide exerted on the oxides of that crystal-fraction of which the mother liquor already afforded an intense light, and so I mixed a fraction from about the middle of the series with a small quantity of ceria. And that was the first mantle made.

The President: It would be well if the Baron would state the dates of the several stages of the invention. I might also remark that you have the right, if chemical secrets are contained in the records, of not being obliged to disclose them to the Court, as the Court can offer no guarantee for the guarding of such secrets.

Baron Auer: In these writings there are no longer any secrets; and I lay stress upon introducing them, because they are of importance for scientific and technical progress. I desire to state from the book that this first experiment was made on April 15, 1891.

Dr. Gallia: There is a sign of interrogation against the term thoria.

Baron Auer: Yes; that is quite correct, for at that time I could not definitely state of what elements the mantle actually consisted. Hence the query before the symbol "Th." I made the next experiment on May 25; and two further ones followed soon afterwards. The results of these experiments, unfortunately, did not bring the hoped-for explanation. Experiment 2 afforded a still more intense light than Experiment 1. Experiment 3 showed about half the light intensity of Experiment 1; and Experiment 4 was much feebler in light than Experiment 1, and the mantle fritted. Experiment 5 afforded a highly fritted mantle of about half the lighting power of that in Experiment 1.

Dr. Elbogen (interrupting): I must point out that the plaintiff is reading his explanations. I desire that to be put on the records.

Baron Auer (continuing): On the 29th of June, 1891, I added a sixth experiment, with another pure thorium, to these. The result was better than that of the last experiment, but yet not comparable with the results of Experiments 1 and 2. All this strengthened me in my impression that I had to do with new substances unknown to science. From these statements, it is to be readily seen that I was at that time still very far from being in a position to designate the new mantle technically, much less scientifically. My labours were in this not advanced stage when the request was made to me in an inconsiderate—and, indeed, if I may so call it, arbitrary—manner to repurchase my Austrian patent rights, because, so they told me, the partners in the business could not agree. Truly, nothing was farther from me then than to take upon myself the burden of such a retail business as the incandescent light undertaking was. Under the pressure exerted on me, I took back my patent rights on repayment by instalments of the purchase price. I may point out that at that time it would have been over-rash to have contemplated the general introduction of mantles consisting almost exclusively of thorium oxide. For, bearing in mind that a kilogramme of thoria earth at that time would have cost thousands of florins, and as, I think, the stock in the whole world was scarcely so much as the comparatively small quantity in my possession, so it is established without doubt that the commercial value at that time of the embryo invention could not have been fixed in the least degree. In the sequel, I will briefly describe the more important of my technical labours, and show what an enormous amount of work was still requisite for the completion of the new invention. At the beginning of July, 1891, I tried to ascertain what was the effect of other oxides on the light-emitting quality of thorium oxide. On the 4th of July, 1891, the first mantle containing uranium was produced; it had a high power of emitting light. Then followed mantles containing uranium and cerium. Later on, I endeavoured, by a series of experiments, to

* It should be noted, as the phrasing of the passages of the agreement here given may not precisely accord with the original, that they have been twice translated—first from English to German, and now from the German to English—Ed. J. G. L.

determine the proportion of cerium oxide, which, starting from a particular fraction, imparted to the mantle the highest intensity of light. For the purpose of comparing the crystal-fractions, I was obliged at that time to resume the working up of thorite—a very rare mineral, rich in thoria. Starting from almost pure thoria preparations, I succeeded, by tireless pursuit of my labours, in finally obtaining a great series of fractions of the rarest purity. The two cardinal experiments were made at the beginning of August, 1891. The oxide of the initial fraction, on heating in the flame, afforded scarcely any light at all. But the mantle which was produced from this fraction sent out rays of blinding brilliancy; it was by far the most powerful light which had ever been produced. It represented the present incandescent gas-light. Towards the beginning of August, immediately after these last experiments, I must have prepared the new patent specification. I might, without particular hesitation, have embodied in it the first of the duration-of-burning experiments which up to that time had lasted for nearly 3000 hours. It was handed over to the Patent Office on the 10th of August, 1891. Those who had to decide upon my invention did not recognize its importance. With the exception of the thoria-uranium mantle, it was denied that it could be the subject of a patent. The German Supreme Court was the first to recognize the reality of my invention, and to assign it the rank which it had deserved from the beginning. Before the new invention came upon the market, the value of the incandescent gas-light patents had sunk to a minimum. I could, had I been capable of such dealing, have bought back many of my patents with quite small means. Nothing was further from me than this. Anyone else in my position might perhaps have done it, and he would have been able to do it lawfully, for the invention just described was no improvement on the earlier ones; it was an entirely new one which was independent of any other. I might point out still that, according to the agreement which I made with Oesterreicher, he would not have been able to make any claim on me in regard to it.

The President: That is a question of law.

Baron Auer: I will refer to one more point. The discovery of this substance which gave so intense a light on heating in a flame caused me to think out as well other methods in which it might be employed. Thus I then had the intention of using it for the electrical production of light, as the patent claims in question made by me show. For this reason, I should not have been in a position before taking out the patent to give even a particle to anyone whose trustworthiness was not beyond all doubt. If anyone had learnt of my researches through a servant or an official, both I and the Companies associated with me would have been thwarted. One word more. In the course of his reply to the impeachment, Counsel on the other side made a very deep cut at my honour. Let me be permitted, therefore, to speak a word in defence. The very Rund whom I am said to have chosen as a suitable object to plunder, came to me, at the time when Lindheim and Co. wished to get rid of the incandescent gas-light business, and begged me, with tears—the scene remains very vividly in my memory—for my support and assent to the proposed transfer of the business. I gave up my interest in it, and thus made it possible for Rund and Co. to be founded. This is all I have to say on the matter.

The President: For what purpose did you order monazite sand in large quantities at the beginning of July?

Baron Auer: I had then already reason to hope that I should find what I was seeking in the monazite sand, which is so rich in minerals. Even though I did not yet know what it was, it was a precautionary measure to procure the raw material. So the order was given.

The President: Would it not have been possible to obtain the pure thorium from monazite?

Baron Auer: Then my invention would have been stillborn. A minimum of thorium is to be found on the earth, and an actual exploitation on at all a large scale could never have been thought of.

Dr. Elbogen: But you sent Mr. Williams, in July, in London, five impregnated mantles, and that led to the agreement being concluded?

Baron Auer: In my book it is recorded that, on the 26th of June, 1891, 25 and 50 grammes of the mother liquor of the first two experiments, which afforded an intense light, were handed to Mr. Williams.

This concluded the evidence of Baron Auer.

Herr Rund stated that it was incorrect that he had begged the Baron with tears to transfer Lindheim's patents to him; and he produced a letter from Baron Auer to Lindheim, in which it was said that the former would be greatly pleased, in the interests of his invention, if Rund took over the patents.

CONCLUDING ADDRESSES.

The President then gave the Counsel for the parties leave to make concluding addresses.

Dr. Gallia said briefly: As the proceedings have shown in an indubitable manner that my client is in the right, I will only ask to be allowed to make known that the patent specification was filed in exactly the same way in Austria as in Germany, to repeat the points formulated by me in the impeachment, and to hand in the statement of costs.

The President enquired of Dr. Gallia how he desired to formulate point 2 of the impeachment.

Dr. Gallia replied that he would word this head thus: No claim against Baron Auer had ever been owing to Rund.

Dr. Elbogen then began his speech. He raised the question whether the plaintiff was entitled to a determining action, or whether he was not obliged to wait till the 18th of June, 1903—the expiration of the three years' prescribed grace. He then explained how it was that Rund had come to state his claims—viz., that he had been obliged to do so in the course of the action for slander against Wachsler. He disputed, moreover, the momentous interest of Baron Auer in asking for a settlement, for Baron Auer rejoiced in very good health, as could be seen that day, and the conditions of his agreements with various companies referred to had nothing to do with this case. Baron Auer should have waited until the 18th of June, 1903, to see whether Rund was going to advance his claims against him. He had preferred, however, to appear himself as plaintiff. Dr. Elbogen then passed on to the merits of the case, and examined the different sources of evidence which had been brought in in the action. He endeavoured thereby to show that, even if Baron Auer's invention was, as he had said, not commercially finished at the critical time, yet he ought to have told Rund at least that he was working on a new invention. The speaker discussed the statements which Baron Auer at times had made as a witness before the Ministry of Commerce in various incandescent gas-light cases, and deduced from them time after time that the tests with the new invention had already been begun prior to the 23rd of June. The invention had not been discovered ready to hand, but was the work of an inventive genius, and of prolonged careful study; and it had been found by the aid of his inventor's intelligence and intuition. It was not a question of the invention being finished in the commercial sense, for, even if it had been a fancy light for American millionaires, the inventor ought likewise to have communicated it to his client. Finally, Dr. Elbogen appealed to the rectitude of the High Court.

Dr. Gallia: I will reply quite briefly to the statements of the defendant's Counsel; they are not in accordance with the facts. I will only call attention to one circumstance. Herr Rund did not give one penny to Herr Oesterreicher towards the business which Herr Oesterreicher bought of Lindheim and Co. Rund owed his partnership with Oesterreicher to the circumstance that Baron Auer gave his assent to the firm of Lindheim, for the transfer of the business to Oesterreicher, conditionally on Rund being partner with Oesterreicher. What had Rund lost, then, when Oesterreicher's business was purchased again by Baron Auer? Not a penny; for he had not put a penny into it. What, however, had he gained? He had gained subsequently the representation of a business, which made him a rich man, which he would have been to this day if he had not embarked in other kinds of business.

Dr. Elbogen replied to this: Rund did not, indeed, put any money in, but he worked for, the undertaking. If Baron Auer had not had reasons for not wishing to appear in Court, he would not have refused to give evidence in the slander action.

Dr. Gallia: He would have had to give evidence on matters about which he must not give it.

The President thereupon terminated the proceedings, and announced that the judgment would be delivered in writing to the parties.

An announcement has been circulated that the Editor of the "Floridsdorfer Zeitung" had no knowledge of the manuscript and letters of C. D. Mohrstedt, referred to in the proceedings in this case, and desired to dissociate his paper entirely from them.

The Leyton Gas-Engine Case.

It may be remembered that in February, 1900, a writ of sequestration was directed to issue against the Leyton Urban District Council to restrain the Council, their servants and agents, from causing a nuisance by employing gas-engines in connection with their electricity-supply works at Leyton. The order was stayed until the 17th inst., on the defendants undertaking to make certain alterations, and to cease altogether to use their gas-engine plant. The matter came before Mr. Justice Buckley, in the Chancery Division of the High Court of Justice, just prior to that date, when Mr. H. Terrell, K.C., moved that the writ should be discharged, or alternatively that the operation of the order might be stayed until further order. He stated that the plant complained of had been put out of use, and steam-engines substituted. Counsel on behalf of the plaintiff (Mr. Hawkes) said he understood the defendants' gas plant had been entirely disconnected, and would never be used again. Under these circumstances, he did not oppose the application, provided the plaintiff's costs as between solicitor and client were paid by the defendants. His Lordship discharged the order, and directed the defendants to pay the costs.

A Water Diviner's Mistake.

At the Ipswich County Court last Wednesday week, a case was heard in which Mr. Alfred Coe claimed £50 from a water diviner named Child for alleged breach of contract to find water on his farm. In September, 1900, Mr. Coe was anxious to dig a well near his farmhouse; and he approached Mr. Child, and asked him if he would prospect for water. He did so, and pointed out a spot. He was asked to what depth they would have to dig; and he made certain measurements, and by these ascertained that the depth would be about 25 feet. Upon this Mr. Coe started digging operations; but although he bored close upon 200 feet, not sufficient water was found to supply the boiler of the engine used. The cost of the experiment was about £220. Mr. Child went into the witness-box, and said he had been a water diviner for 37 years, and had discovered water in thousands of cases. He professed to find out the exact spot where a good supply of water could be found, but not the depth. Water ran in veins under the earth; and he professed to show people exactly where the veins were. He might have given his opinion as to the depth, but nothing more. On the previous Friday he visited the well in question, and found there was quite 100 feet of water in the borehole. Mr. Wild (who appeared for Mr. Child) said his client had been employed by His Majesty and leading gentlemen in East Anglia, and had never failed to find water at the spots indicated. He knew there were people who in their ignorance did not believe in this so-called science of water divination—looking upon it as jugglery, necromancy, and the black art. But it was a curious natural law, which even Mr. Child could not explain, that, by his animal magnetism acting through the twig, he was able to locate the spot where water could be found. It was only necessary to properly perform his contract that Mr. Child should bring to his service the best of his skill and judgment. Even if he gave an estimate of 25 feet as the depth they would have to sink, was he guaranteeing it? This was simply a speculative action brought after the proceedings against his client last year. The Judge gave the Jury several questions to answer; and these they replied to in such a manner that both sides claimed the verdict. On being asked, however, what they intended their finding to be, they retired again, and eventually brought in a verdict for Mr. Coe, with £10 damages. A stay of execution was granted.

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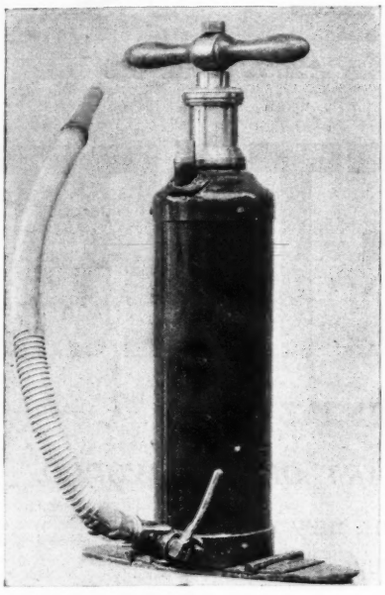

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MISCELLANEOUS NEWS.

PROJECTED GAS LEGISLATION FOR LONDON.

Prints of the Bills of which notices were given in November by the Gaslight and Coke, Commercial, and Crystal Palace District Gas Companies, as well as by the London County Council—to effect certain changes in connection with the gas supply of the Metropolis and one of its principal suburbs—were available on Monday last week; and, by the courtesy of the respective Agents, we can give to-day a fuller indication of the scope of these measures than we were in a position to do on the publication of the "Gazette" notices.

Gaslight and Coke Bill.

The Bill promoted by the Gaslight and Coke Company is to enable them to raise additional moneys, and purchase, take, and hold lands, and for altering the standard price of gas, redeeming capital, and other purposes. The preamble sets forth that the Company was originally incorporated by Royal Charter dated April 30, 1812, under the authority of 50 Geo. III., cap. 163, and received further powers under divers subsequent Acts—being finally incorporated in perpetuity by 59 Geo. III. cap. 20. By the Company's Act of 1868, all the prior Acts were repealed, and their provisions consolidated; and the Company are now subject to that and other Acts obtained down to 1898. By the Act of the last-named year, the debenture stocks were consolidated and converted into one stock, called "three per cent. consolidated debenture stock;" and it is now considered to be expedient that the Company should have further power to raise money by the creation and issue of £1,000,000 of debenture stock. They are willing to alter their standard price in the manner set forth in the Bill, and they ask that provision should be made for enabling them to carry such willingness into effect. Owing to the closing of several of the Company's stations, there is a certain amount of obsolete capital; and it is deemed desirable to provide for its redemption. Another object of the Bill is to set at rest doubts which have arisen as to the tenure of certain lands and hereditaments, and to enable the Company to acquire other lands.

It is proposed to incorporate in the Act the Lands Clauses Acts, except the provisions with respect to the purchase and taking of lands otherwise than by agreement; the Companies Clauses Act, 1863, Part III., except certain specified sections; and the Companies Clauses Act, 1869, with like exceptions. The incorporated provisions of the two last-named Acts are to be applicable as though the Act to be applied for authorized the money which the Company are thereby empowered to raise on debentures, to be raised on mortgage or bond. The new debenture stock is to be offered by auction or tender, at a reserved price; and any premium realized, after the attendant expenses have been deducted, is not to be considered as profits of the Company. The money so raised is, of course, to be applied for the purposes to which the capital of the Company is properly applicable. The new stock is to rank next after the existing 3 per cent. consolidated debenture stock. It is proposed that, on and after Jan. 1, 1904, the standard price of the Company's gas shall be 3s. 6d. per 1000 cubic feet, in lieu of the present 3s. 9d.; and for every penny or part of a penny by which the authorized price in any calender year exceeds or is less than the standard, the standard dividend for such year is to be reduced or increased by 2s. 8d. in order to arrive at the "authorized rate." Section 16 of the Company's Act of 1898 is to be amended by the substitution of 4s. 3d. for 4s. 9d., 2s. 8d. for 2s., and 3s. 4d. for 2s. 6d. Before the Company are to be entitled to distribute a dividend in excess of the standard, they are to set aside, in respect of the first increase of 2s. 8d. in the authorized rate, a sum up to, and not exceeding, 8d. per cent. on the total amount of the Company's ordinary stock at the end of the calendar year, to form a redemption fund; and after setting aside this sum, they may distribute, by way of addition to the standard dividend, up to 2s. per cent., and similarly for each subsequent increase of 2s. 8d. in dividend. The Company are not to distribute in any year, to the holders of ordinary stock, more than 4 per cent., without making the provision for redemption specified. The redemption fund is to be applied, during the year following that in respect of which it is set aside, in purchasing ordinary stock of the Company. These provisions are to cease to operate as soon as the Board of Trade has been satisfied that the obsolete capital has been extinguished. The Company's reserve fund is not to be used for the purpose of distributing in any year to the ordinary stockholders a dividend in excess of 4 per cent. The Company seek power to hold lands, use them for the construction and maintenance of gas-works thereon, and acquire others; but they are not to purchase working-class houses except under certain conditions.

London County Council's Bill.

Under the title of the "Gaslight and Coke Company's Acts Amendment Bill, the London County Council are to promote a Bill to alter the standard price to be charged by the Company, and also the illuminating power of the gas, and to make provisions with respect to the supply of burners and the formation of a capital redemption fund. The preamble sets forth that the price charged to the consumers on the north of the Thames is considerably higher than those of the South Metropolitan and Commercial Companies, and also in excess of their own charge south of the Thames. This is shown by setting out the prices in tabular form. It is urged that the Company's charge north of the river is "unduly high, and constitutes a serious burden upon the consumers of gas for domestic and manufacturing purposes." The preamble goes on to point out that the standard prices relating to the South Metropolitan and Commercial Gas Companies have been reduced, and now stand at 3s. 1d. and 3s. 3d. respectively, for 14-candle gas, compared with 3s. 9d. in the case of the Gaslight and Coke Company. Since the last-named figure was fixed in 1876, the "proper" cost of production of gas has become less; and the rate of interest at which capital can be obtained is lower. It is therefore considered expedient by the Council that provision should be made for the reduction of the standard price, and also of the illuminating power of the gas, so as to bring the latter down to the 14 candles sanctioned by Parliament in the cases of the two other Metropolitan Companies. Attention is next called to the effect of the consolidation of the Company's capital under the Act of 1898; and it is remarked that, as a considerable part of the money raised has been expended on works which have or may become obsolete, it is expedient that provision should be made for setting aside a fund for the redemption of capital.

There are only six clauses to the Bill. The first, relating to the alteration of the illuminating power and the standard price of gas, specifies that the former shall be 14 candles and the latter 3s. 1d., with a sliding-scale—1s. 4d. per cent. more or less dividend being allowed in respect of every penny decrease or increase in price. It is proposed to amend section 16 of the Company's Act of 1898, so that the figures 4s. 9d. and 2s. contained therein shall stand 3s. 10d. and 2s. 8d. The Company are to be called upon, when required by the consumers, to supply and fix, free of charge, a sufficient number of "governed" burners suitable for the consumption of gas of the illuminating power prescribed; and, as soon as reasonably practicable, the slot-meter consumers are to be furnished with burners "similarly suitable" for use with the lower-power gas. Clause 5 provides for the formation of the redemption fund alluded to in the preamble. If in any half year the divisible profits admit of a distribution at a rate exceeding 4 per cent. per annum on the converted ordinary stock, the Company are to carry to a redemption fund one-half of the amount the Company would be entitled to distribute, and it is to be used in the following half year in the purchase of portions of this stock on the Exchange. The last clause sanctions the payment of the costs and charges of the Act out of the moneys available for general county purposes.

Commercial Gas Bill.

The Bill promoted by the Commercial Gas Company is a short measure to make provision for the testing of gas supplied by them. It consists of the preamble and practically one clause. The former sets forth that, by section 34 of the Company's Act of 1875, it was provided that the burner for testing the Company's gas should be Sugg's "London" argand—the burner prescribed and used by the Metropolitan Gas Referees for testing gas. Section 52 specified that the gas supplied by the Company should, with respect to its illuminating power, be such as to produce, when consumed at the rate of 5 cubic feet per hour in that burner, a light equal to 16 candles; and according to section 53, the standard price to be charged by the Company for such gas should be 3s. 9d. per 1000 cubic feet, subject to increase or decrease as provided for in the Act. With a view to enabling the Company to meet the demands of consumers more economically and efficiently, the illuminating power of the gas was, by their Act of the present year, reduced to 14 candles; and in consideration of the saving to the Company in the cost of manufacture which would thus be effected, the standard price was fixed at 3s. 3d., subject to increase or decrease. The Bill for the last-mentioned Act contained a clause modifying the provisions of the Act of 1875 relating to the testing of gas, so as to make them appropriate for the testing of 14-candle gas, and uniform with the provisions affecting the supply of gas of this illuminating power in other parts of London. But, in view of representations made on behalf of the Gas Referees during the passing of the Bill through Parliament, the Company agreed to withdraw the clause, in the belief that the Referees would have full power to prescribe the apparatus to be used in, and the method of, testing gas appropriate to the reduced candle power. The Referees have, however, intimated that they are bound by the provisions of the Act of 1875, both with regard to the burner to be used and the rate at which the gas is consumed. It is then pointed out that the effect of testing gas of the reduced candle power under these restrictions will be to prevent consumers from obtaining gas of the illuminating power which was contemplated when the Act of the session just closed was passed, and to deprive the Company to a large extent of the benefits in consideration of which the price to be charged by them for gas was by that Act reduced. The Company therefore consider it to be expedient that the provisions of the Act of 1875 with respect to testing should be amended in the manner set forth in the second clause of the Bill, which read as follows:—

> The burner for testing gas supplied by the Company shall be Sugg's "London" argand, as prescribed by section 34 of the Act of 1875, and, in making such testing, shall be so used that the gas shall, notwithstanding anything contained in section 52 of the Act of 1875, be burnt at such a rate as shall give a light equal to 16 candles. The said burner shall be used with the chimney prescribed by the Gas Referees for gas of an illuminating power of 14 candles.

Crystal Palace District Gas Bill.

This is a Bill to confer further powers upon the Crystal Palace District Gas Company with respect to the purchase and holding of lands and the testing of the illuminating power of gas; and by it authority will be sought to change the name of the Company. According to the preamble, the Company was incorporated in 1858, for the purpose of supplying with gas certain parishes and parts of parishes now in the counties of London, Surrey, and Kent, forming a district in the neighbourhood of the Crystal Palace. Owing to the increase in the demand for gas, additional land is required; and power to purchase it is sought, as well as authority to extinguish a right of way across the Company's works at Bell Green, Lower Sydenham, and provide a roadway in substitution therefor. By section 17 of their Act of 1873, it was provided that the Company's gas was, for the purposes of the application to the undertaking of the Gas-Works Clauses Act, 1871, to be of 14-candle power; but by section 28 of their Act of 1893, this was raised to 15 candles, and further provisions were made with respect to the prescribed burner and the method of ascertaining the illuminating power. In the same Act, the standard price was fixed at 3s. 2d. per 1000 cubic feet, with a sliding-scale of price and dividend. Under section 17 of the earlier Act, it was provided that the gas supplied by the Company should not contain more than 20 grains of sulphur in any form in 100 cubic feet. But by section 28 of the Act of 1893, that section was amended so as to

provide that no forfeiture should be incurred in the case of an excess, unless it should amount to 2 grains upon the average of six consecutive week days, or 10 grains upon any one day. It is pointed out that the reduction of the sulphur compounds in accordance with these provisions necessarily causes a nuisance to the inhabitants in the neighbourhood; and it is found by experience to be of no advantage to the consumers. It is therefore considered expedient that the two Acts named should be amended in respect of the provisions relating to the illuminating power and the testing of the gas, and that the dividend should be dependent upon the price of gas in any half year, instead of in any year, as provided by the Act of 1893. It is proposed to reduce the standard prices from 3s. 2d. to 3s., and from 2s. 10d. to 2s. 9d.; to ask for further powers with reference to the sale of unissued stock to the consumers and employees of the Company; and to make provision for the representation of the latter upon the Board.

Coming to the clauses of the Bill, clauses 4 to 8 deal with the lands proposed to be taken, and incidental matters. Clause 9 provides that on and after Jan. 1, 1904, the illuminating power of the gas shall be 13 candles, and the standard price, as already stated, 3s. per 1000 cubic feet. If the price in any half year exceeds this by a penny or less, the dividend is to be reduced 1s. 3d. per cent.; but if the price is a penny or more below 2s. 9d., the dividend shall be increased by the above-named amount. By clause 10 the Company undertake, upon the reduction of the illuminating power, and at any time within two years from Jan. 1, 1904, when required by the ordinary consumers, to supply and fix, free of charge, a sufficient number of burners suitable in all respects for the consumption of gas of the illuminating power prescribed. The Company will also, as soon as reasonably practicable after the date named, and at the latest within twelve months therefrom, "exchange the burners used by consumers of gas supplied by the Company by means of slot meters for burners similarly suitable for the consumption of gas of the illuminating power prescribed." Notice of these provisions is to be given on each demand-note sent out during the period named. Clause 11 contains provisions in regard to the testing of gas. The illuminating power is to be tested by Sugg's "London" argand burner No. 1. In making the test, the gas is to be burned "at such a rate as to yield the maximum light for which the burner is designed." Only one test is to be made; and before commencing it, the gas must have been burning for at least half-an-hour. The apparatus used is to be the table photometer and the 10-candle pentane lamp. The penalty for deficiency in illuminating power exceeding 0·5 candle but not exceeding 1 candle is not to be more than 40s.; beyond this, anything up to £20. No forfeiture is to be incurred in any case of deficient illuminating power or excess of impurity resulting from unavoidable cause or accident. Clause 12 provides for changing the name of the Company to the "Sydenham Gas Company." The remaining clauses relate to the sale of unissued stock, the representation of the employees upon the Board, and the transfer of stock held by them.

London County Council (General Powers) Bill.

Of the 70 clauses in this Bill, the principal one is the 54th, which sets forth that from and after the passing of the Act, section 6 of the South Metropolitan Gas Company's Act of 1900, describing the burner for testing the illuminating power of the gas, is to be repealed.

THE LIGHTING, HEATING, AND SMOKE ABATEMENT EXHIBITS AT THE CRYSTAL PALACE.

It may, we think, now be taken that the so-called Lighting, Heating, and Smoke Abatement Exhibition at the Crystal Palace is as near completion as it ever will be. The process of building it up to its present state has been a slow and wearisome one; and, now that it is finished, the verdict upon it must be that it is extremely thin—so poor, in fact, that we have not yet seen it included among the attractions of the Palace in the ordinary newspaper announcements. All told, there are not more than a dozen stands in the South Nave; and the exhibits are just about as ill-assorted as they could possibly be. The public must indeed wonder what connection they have one with the other.

Walking from the Centre Transept, the first stand is occupied by the Chemical Engineering Company and Wilton's Patent Furnace Company, who must regret the fate that took to the Palace four or five of their fine specimens of heavy apparatus and appliances to be set at the head of the classes and types of goods that succeed their exhibit. In fact, their plant, and a show-case of the United Asbestos Company, Limited (containing a miscellaneous collection of their well-known specialities), compose the only part of the show which would specially appeal to gas engineers. However, chief among the exhibits on the stand of the Chemical Engineering Company is a splendid example of Wilton's patent saturator and discharger and draining-table; and very thoughtfully inside the saturator has been placed an incandescent electric light, so that the interior is exposed to careful examination. Strength, simple construction, and excellent workmanship are among the manifest merits of the plant; and this judgment in respect of the saturator is verified by an announcement that "the make of sulphate of ammonia from the first round saturator constructed has exceeded 40,000 tons, and the repairs have been practically *nil*." So that there should be no question about this, it is mentioned that this saturator "can be seen working, by appointment." The other exhibits consist of parts of Wilton's patent furnace, all of which are open to critical inspection. As stated, the stand of the United Asbestos Company contains the only other display of direct interest to the gas engineer.

There are two stands specially devoted to gas heating and cooking apparatus; but the stoves do not, without further experience, appeal to us as types that have a promising future. They have not, so far, come prominently to the front; but this alone is not a cause for condemnation. First of all, there is a heating-stove known as the "H. C. L.," which is said to require neither chimney nor flue of any kind, owing to "the combustion being perfect and complete." In this stove, the gas is injected into a large open double-coned tube, the upper part of which is inverted so that a contraction is formed in the centre after the manner of the Kern bunsen tube. At the top of this is placed a pyramid screen, through which the gas passes into a chamber of about the same diameter as the bottom part of the lower cone. This chamber is capped by a flat gauze screen, a little above which is supported a radiating-stone. The whole is encased in an open-work iron frame with a hood above similar to the old fashioned oil-heating hall-stoves. The stove can be used for boiling by removing the hood and the radiator, and placing a grid on the hood supports. The stove has to be lighted above the flat screen; and in the "instructions for use" great emphasis is laid upon the necessity for carefully observing them before "attempting to light the stove." This anxiety suggests some point of danger, which, if it exists, will not be a commendation for ordinary household use. The consumption of gas is only from 10 to 12 cubic feet per hour. Of the behaviour and performance of the stove we cannot speak confidently after only a few minutes' observation; but the hygienic advantages claimed for it are great. There is "no smell or smoke," and "no damage can be done to walls, pictures, plate, or furniture." On the contrary, the stove "generates an uniformly warm temperature, and produces a fresh healthy atmosphere." If all this is true, then here we have the acme of perfection in a heating appliance.

The only other stand entirely occupied by gas cooking apparatus is tenanted by Messrs. R. Nicholls and Co., of Hove. There is quite a variety of cooking-ovens shown; but they are all constructed on the same system. The oven (which is cylindrical, and is erected on a stand) is formed of a double case; and the annular space constitutes a hot-air jacket round the oven. The heated air is obtained from gas-flames beneath the oven. It will be seen that, in this way, the products of combustion cannot come in direct contact with the food being cooked. The idea is one which will commend itself to a few who object to the ordinary system of constructing ovens with the gas-flames directly open to the food; but we have some doubts on the point of efficiency—first, in respect of the time occupied by the cooking; and, secondly, in regard to the exhaustion of the moisture from the food so cooked.

There are two or three stands containing some good examples of coal grates; but these do not specially concern "JOURNAL" readers. On one stand, occupied by Messrs. Clark, Hunt, and Co., were noticed three or four examples of Clark's patent hygienic stoves, but not of the most attractive forms of that firm's productions. The London Warming and Ventilating Company (who undoubtedly have the best display of coal ranges and coal, anthracite, and coke fires) show a few gas-log fires; and it is seen that they also make the "Gasteam" radiator, which for a consumption of 1¼ cubic feet of gas per hour per section gives results which make it, it is said, "the most economical heater in existence." The radiator is self-contained and movable; and the only external attachment is to the nearest gas-pipe.

The lighting section is altogether barren of special interest. A stand, which is the most pleasing in this department, is devoted to the display of the merits of the "Holophane" globe; but they are too well known to require extended reference. Then the Imperial Lighting Company are giving an exposition of their system of "Fairyland" electric illumination. The Imperial "S. C." Acetylene Company, Limited, have a display of acetylene generators, lamps, and fittings; and also an exhibit of flexible tubing for high-pressure steam, oils, gas, and water. On one side stand the dissimilar businesses of selling tobacco-pipes and "Alladin" gas-lighters are proceeding. The latter is a cheap form of lighter, and it is attributed with an effective life equal to a use of between 5000 and 7000 ignitions before the battery gives out.

This exhausts all that we can find, in this curious medley of exhibits, to which to call attention. The show, as a whole, is not representative of anything; and, in regard to lighting and gas heating, the "Organizing Commissioner" has only succeeded in capturing one or two exhibitors who are far in the rear of the great firms who work in these two large fields of commercial enterprise. It is to be hoped that this witnesses the last public display of such a character in which gas appliances, at all events, will have a part.

A TWO THOUSAND CANDLE POWER GAS-LAMP.

Over the closet-urinal in Farringdon Street, north of Ludgate Circus, the James Keith and Blackman Company, Limited, have erected a lamp on their well-known system for the City Corporation. The illumination it affords is a striking spectacle; the candle power totalling at least to 2000. The lamp has been erected on the old heavy column which formerly carried four arms, with a lantern on each. These arms have, of course, been discarded; and in fitting up the new lantern the firm have given quite an ornamental and appropriate finish to the column by a judicious application of wrought-iron work. Although the appearance of the lantern does not suggest that it is so much, as a matter of fact it has a diameter at the head of no less than 4 feet. It is of the ordinary hexagonal type, and is fitted with a cluster of six burners. The Keith and Blackman Company have been giving special attention to the question of anti-vibrators for this large type of street-lamp, and, it seems, very successfully. They have devised one which is not at all unsightly, and would be regarded as part of the usual fittings were it and its special purpose not pointed out. The main part of the device are four hoops of corrugated tubes; and these form the gas-ways and supports for the cluster. The tubes are flexible, and have a spring in every direction, both vertically and horizontally. A difficulty with most forms of anti-vibrators is that they are so sensitive to the slightest movement; and the result of this is that the mantles are kept in a constant state of agitation. Without close observation this is imperceptible. But it is so, and, in consequence, there is a continuous wearing effect on the mantles. The duty of an anti-vibrator is to overcome accidental or ordinary shock of passing traffic, and not to keep the mantles in a condition of perpetual motion. To overcome the extreme sensitiveness in the case of this new arrangement, between the four hooped tubes is an additional fitting, the special purpose of which is to break the sensitiveness; and this it does without detriment to the performance of the designed object of the anti-vibrator. When the cluster begins to oscillate through any cause, the little central fitting gradually brings it to rest.

AMERICAN PROMOTERS AND EUROPEAN GAS SUPPLY.

Reports recently reached this country to the effect that a movement was on foot for placing the gas supply of Paris in the hands of a Corporation having a capital of about $50,000,000. We learn from "Progressive Age" that the projectors of the scheme contemplate the formation of two Corporations—one to be organized under the laws of France, which will control the manufacturing operation and supply gas in Paris, and the other, incorporated under the laws of New York or New Jersey, which will be a Securities Company, and practically own the concern in France. The Securities Company will hold the stock and bonds of the Operating Company. Under the French laws, a Company incorporated in a foreign state or nation would not be able to carry out the plan of absorption, and carry on operations under the franchises of the Paris Gas Company. This can only be done by a Corporation formed pursuant to the laws of France, and under direct jurisdiction of the Government. The American Securities Company will be the master of the situation—the French Corporation being under their absolute control. This plan will give the American capitalists the protection of American laws in their investment, and will insure them against conditions which might militate against their interests if they were protected only by the statutes of a foreign nation. The question of a bonded indebtedness is another matter still undecided, though it is most probable that a large bond issue will be a part of the scheme. Our contemporary says the men who are behind the enterprise are silent as to the American capitalists interested except the names of Mr. Anthony N. Brady and Mr. William C. Whitney, who are mentioned in connection with the project. According to a Laffan telegram sent from Chicago last Thursday, a Trust is in course of formation, capitalized to the extent of nearly a billion dollars, to control the gas supply in several important European cities. Mr. J. D. Rockefeller, of oil fame, is a stockholder to the extent of some $300,000,000. The following particulars in regard to the above matter, from the New York correspondent of the "Daily Telegraph," appeared in that paper on Saturday: "While the reports about the formation of a billion-dollar Trust to control the gas output of the principal cities of Europe has been much exaggerated, there is a plan on foot, in which several great capitalists are said to be interested, to consolidate the electric power and lighting, and possibly the traction interests, of Paris. Mr. Anthony N. Brady, Mr. G. O. Knapp, and Mr. C. K. G. Billings, who already represent great electric light interests in New York and Chicago, will sail for Europe to look over the situation in the French capital. They refuse to disclose the exact details of their schemes; but they admit that negotiations have preceded their trip. It is stated that the proposal which they will consider will, if carried to completion, call for a capitalization of $50,000,000, and that the stock will be held partly by Americans and partly by French capitalists. Mr. William C. Whitney's name is mentioned, on apparently good authority, in connection with this matter."

UNITED STATES GAS APPLIANCE STATISTICS.

An official document lately issued in connection with the twelfth census of the United States is devoted to "Manufactures," and it contains the following statistics, which, though relating to the year 1900, may be of interest: —

Items.	Gas and Lamp Fittings.	Gas and Oil Stoves.	Gas Machines and Meters.
No. of establishments	223	35	114
Capital	$10,009,239	$3,766,065	$4,605,624
Salaried officials	875	191	257
Salaries, total	$992,003	$231,436	$251,382
Wage earners, total	7,642	2,471	2,167
Wage-earning men	5,582	2,458	2,093
,, women	1,754	8	64
,, children	306	5	10
Wages paid, total	$3,504,301	$1,138,442	$1,185,959
Miscellaneous expenses	1,023,036	274,242	191,058
Cost of materials	5,013,597	2,501,568	1,943,769
Value of products	12,577,806	4,579,700	4,392,730

The total value of all manufactures is given at $13,014,287,498; the cost of materials used, $7,348,144,755; miscellaneous expenses, $1,028,035,611; salaries, $404,230,274; and wages, $2,328,691,254. This would leave a profit of nearly 20 per cent. on the total capital of $9,835,086,909. The firms included in the return carry on businesses in connection with the following: Calcium lights, 19; charcoal, 183; coke, 241; electrical apparatus, 580; electrical construction and repairs, 1162; fertilizers, 422; graphite refiners and producers, 11; manufactured ice, 775; lamps and reflectors, 156; matches, 22; petroleum refining, 67; plumbers' supplies, 174; plumbing and gas and steam fitting, 11,876. Gas companies, with their 877 reported works, show up well among those with whom they deal.

The Flavel Range and Imperial Gas-Stoves, Limited, has been registered with a capital of £50,000, in £1 shares, to acquire the business of manufacturers of, and dealers in, kitcheners and heating apparatus, as now carried on by Sydney Flavel, as Sydney Flavel and Co., at the Eagle Foundry, Leamington, Warwickshire; to acquire the business of boiler and range engineers as carried on by the Imperial Stove Company and Radcliffe and Co. at the Old Foundry, Leamington, and elsewhere; and to act as general engineers, iron and brass founders, and makers of gas and steam cookers, agricultural implements, pipes, fittings, &c. There will be no initial public issue.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1746.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
300,000	100	July 1	5	Australian 5 p.c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 13	6½	Bombay, Ltd.	5¾—6	..	5 8 4
40,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 6
380,000	Stk.	Aug. 14	12	Brentford Consolidated	247—252	..	4 15 3
270,000	,,	,,	9	Do. New	180—185	..	4 17 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	134—139	..	3 11 11
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	110—113	..	3 10 10
220,000	Stk.	Sept. 11	10⅝	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7⅛	Do. A. Ord. Stk.	152—157	..	4 18 9
460,000	20	Sept. 26	10	British	39½—40½	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c.	22—24	..	5 0 0
82,850	10	,,	9	Do. 7 p.c.	18—20	..	4 10 0
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10—10½	..	6 13 4
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 11	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	14¾—15¾	..	6 9 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	250—260	..	4 16 2
251,875	,,	,,	9⅜	Do. New do.	200—205	..	4 12 8
271,875	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	130—134	..	3 7 2
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	133—138	..	5 15 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Aug. 28	5⅛	Crystal Palace Ord. 5 p.c.	117—122	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5
486,090	10	July 30	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Aug. 14	4	Gas-light and Coke 4 p.c. Ord.	81—83	..	4 13 0
2,600,000	,,	,,	3½	3½ p.c. max.	£6—88	..	3 19 7
3,799,735	,,	,,	4	4 p.c. Con. Pref.	110—112	..	3 11 5
4,193,975	,,	Dec. 11	3	3 p.c. Con. Deb.	91—93	..	3 4 6
70,000	10	Oct. 30	8	Hongkong & China, Ltd.	14½—15½	..	5 3 3
3,800,000	Stk.	Nov. 13	10	Imperial Continental	201—204	..	4 18 0
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
561,000	Stk.	Aug. 28	10	Liverpool United A	224—225	+1	4 8 6
718,100	,,	,,	7	Do. do. B	165—167	..	4 3 10
306,083	,,	June 24	4	Do. do. Deb. Stk.	116—118	..	3 7 10
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4—4⅛	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	104—108	..	4 12 7
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 13	2½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.	104—105	..	4 5 9
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.	99—100	..	3 10 0
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	140—145	..	5 10 4
00,000	5	Sept. 26	7	Ottoman, Ltd.	6½—7	..	5 0 0
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Oct. 15	7	River Plate Ord.	10—10½	..	6 13 4
300,000	Stk.	June 24	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	Sept. 26	8	San Paulo, Ltd.	11⅜—12½	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	233—235	..	4 5 1
6,000,000	Stk.	Aug. 14	5⅓	South Met., 4 p.c. Ord.	116—119	..	4 9 6
1,700,000	,,	July 11	3	Do. 3 p.c. Deb.	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord.	103—107	..	4 13 6
87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton A. 5 p.c.	118—123	..	4 17 7
302,520	,,	,,	4½	B. 3½ p.c.	93—96	..	4 13 9
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
230,000	5	Aug. 14	5½	West Ham, 10 p.c.	10—11	..	4 6 4
172,000	10	,,	6½	Do. 7 p.c.	13½—14½	..	4 9 8
				WATER COMPANIES.			
780,652	Stk.	June 24	11½	Chelsea, Ord.	315—325	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref.	152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.	225—235	..	3 8 2
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
700,000	50	Dec. 11	8	Grand Junction 10 p.c. max.	113—118	..	3 7 10
310,000	Stk.	Sept. 26	4	4 p.c. Deb.	125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	300—310	..	4 10 4
160,000	,,	,,	7	Do. New, 7 p.c. max.	220—210	..	3 6 8
1,043,800	100	June 24	11	Lambeth, 10 p.c. max.	310—320	..	3 8 9
406,200	100	,,	8½	Do. 7½ p.c. max.	225—235	..	3 8 2
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Aug. 14	12⅝	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
902,300	Stk.	Dec. 11	7	Southwark and Vauxhall Ord.	205—210	..	3 6 8
126 500	100	,,	7	7½ p.c. max.	195—205	..	3 8 4
489,200	Stk.	,,	5	5 p.c. Pref.	151—154	..	3 4 11
1,019,585	,,	Oct. 15	4	4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex.	295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.	97—99	..	3 0 7

ELECTRIC LIGHTING NOTES.

The City in Darkness.

For about five minutes last Friday evening, the chief streets in the City of London were rendered all but totally dark, owing to an accident to a machine at the generating station of the Electric Lighting Company on Bankside. Just before half-past six, Cheapside, Cannon Street, King William Street, Queen Victoria Street, Threadneedle Street, and the spaces around St. Paul's Cathedral and the Mansion House, became suddenly so dark that the few people who were about could scarcely see their way. Had it not been for the lamps on the Mansion House balcony, the traffic at that spot would probably have been brought to a standstill. So far as can be remembered, the whole of the City has not been similarly affected before; and happily the inconvenience caused by the mishap was of short duration.

An Inquiry by an Expert at Kingston.

After having a few weeks ago resolved to defer for six months the question of the appointment of an expert to report upon the municipal electricity installation, the Kingston Town Council last Tuesday considered a recommendation from the Lighting Committee that Mr. H. R. J. Burstall should be called in, at a fee of a hundred guineas. After some discussion this proposal was unanimously agreed to, though the Committee naturally declined to give any undertaking that they would act on Mr. Burstall's advice when they received it. In moving the adoption of the recommendation, Mr. Clarke, the Chairman of the Lighting Committee, reminded the Council of the various steps that had been taken in regard to the suggestion that an expert should be called in. He said that a public meeting last March urged the appointment of an expert; and eventually the Council agreed to it, and decided to ask the President of the Institute of Electrical Engineers to make a selection of three names to be submitted to the Council. This proved abortive, however, as the President declined to do it. When the appointment of Mr. Burstall was first moved, he (Mr. Clarke) proposed that it be deferred for six months; and that was carried. His reason for this was that he wanted to see the result of the new chimney shaft, the new economizer, and other things. They now had some data to go upon with regard to these matters; and though the six months had not elapsed, he agreed to the immediate appointment of an expert, because there were many questions upon which his advice would be of great assistance.

Dangers of Electric Currents.

An extraordinary fatality occurred at the Fulham Public Baths last Tuesday evening. It appears that the attendance was only moderate, and that just after seven o'clock two men, named William Brown and William Arthur Line, aged respectively 22 and 35, paid for warm baths. They were shown into the slipper baths, and, so far as could be seen at the time, these were in their ordinary condition. Some twenty minutes later, one of the attendants heard a scream proceeding from one of the compartments, and on opening the door he found Line clinging to the pipe which conveys the wires used in connection with the electric light, by which the baths are illuminated. Having called for assistance, he went to the bath occupied by Brown, which was at some little distance, the intervening compartments being empty, and Brown was found lying on the floor dead. By this time Line had been rescued from his dangerous position. A medical man was called in, and artificial respiration was resorted to; but the unfortunate man died in a few minutes. Both bodies were afterwards removed to the mortuary. Each of the compartments was lighted by a single incandescent lamp, the wires to which ran along the tops of the partitions, encased in a steel barrel, and ordinarily out of the reach of the bather. The strength of the current was 200 volts. The supposition was that one of the men, coming in some way in contact with the wire, uttered cries which attracted the attention of the other, who tried to climb the partition to look over, and was similarly affected. A post-mortem examination of both bodies took place during Thursday, and arrangements were made for opening the Coroner's inquiry on Saturday. This was duly done by Mr. C. Luxmore Drew, and among those present was the Mayor of Fulham (Mr. P. Lawson). Ernest Chivers, an attendant at the baths, stated that he remembered Line coming for a bath about seven o'clock on the evening in question; and he was accommodated with one. About a quarter of an hour after he had entered the bath-room, witness heard screams, and found Line hanging from the galvanized iron railing running along the top of the bath front; his feet being in the bath. Deceased said it was electricity which held him; and he asked witness to pull him off. Being unable to do so, he ran to the switches and drew them out to cut off the current. The Superintendent and a doctor were at once summoned, and artificial respiration was tried without success. Several of the other bathers said they had felt shocks. In No. 4 bath witness was unable to open the door at first, and when he did so he found Brown lying face downwards in the bathroom. The doctor was again called, and he pronounced life to be extinct. In reply to Mr. Moyses, who represented the relatives of the deceased, witness stated that he had no idea there was any danger in connection with the baths. Lee Jones, another attendant, gave similar evidence. Mr. Alfred A. Barker, the Superintendent, said he was called when the first man was found. He tried artificial respiration without effect. He told the attendants to see that no one else was in the baths. At that time another bather complained of having felt a shock. Witness, in reply, said "Nonsense;" but on touching the spot indicated he himself received a shock. Afterwards he was called to the man Brown, and found him dead on the floor of the bath. Other bathers deposed to having received shocks. Dr. M. J. Williams said that when he was called to the man Line he found life extinct. Artificial respiration was of no avail. Later he was called to Brown; but in that case life had been extinct

SO GLAD!!!

This is my last season,

LITTLE'S PATENT

HOT COKE CARRIER

will be universally adopted in

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Our Furnaces and Installations of Inclined Retorts have always been made a success, and our Patent Shot-pouch method of charging is the most Automatic System.

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SMETHWICK.

about an hour. He made a post-mortem examination. In the case of Line, all the organs were found to be healthy. The heart showed signs of shock or fainting. The blood was very dark, which was an indication of electricitis. Death was due to syncope from an electric shock. Very little electricity would cause death under such circumstances, as the conductors were good and the resistance was low. The warmer the water the more easily the current would be taken. An alternating current of 200 volts was in use, and 96 volts had proved fatal. In the case of Brown, the same appearances were found; and death was due to electric shock. The Coroner said he should require expert evidence; and, as the Inspector of Factories wished to be present, the inquiry would be adjourned.

MUNICIPAL ELECTRICITY SUPPLY AT NEWPORT (MON.).

The "Journal's" Criticism Criticized.

The "South Wales Daily Argus" for last Tuesday contained the following article on the passage in our "Electric Lighting Memoranda" in the preceding issue, dealing with the above subject:—

The "Journal of Gas Lighting, Water Supply, &c." appears to exist chiefly for two purposes—to uphold the interests of capitalistic monopolists, and to show that the impudent working classes (whom the kindly capitalists so generously allow to work for them!) ought to be kept in their places. It follows, therefore, that the tone of the paper will be antagonistic to municipal enterprise and antagonistic to labour. Incidentally, too, as gas is the rival of electricity, nothing could be more pleasant to this journal than to prove the flagrant commercial immorality of municipal enterprise in connection with the supply of electricity. Newport has provided a text for this supporter of the individualistic, capitalistic, monopolist creed. Under the heading of "Electric Lighting Memoranda," in the issue of Dec. 16, it is said that "a very striking example of municipal trading in practice is furnished by the proceedings of the Electricity Committee of the County Borough of Newport." To make a long story short, the point of the charge is that whereas the Office Manager's report as to the cost of generation and distribution presented in October showed a cost of 2·65d. per unit, the Corporation a month later accepted a recommendation that electrical power should be supplied at 1d. per unit for motors in use day and night.

The "Journal of Gas Lighting" said that the transaction could not be justified on any ground—that the ratepayers of Newport are taxed in order that this particular consumer may have power for less than cost. There is more about "the lengths to which a municipality will go in competition with a gas company"—this is quoted as "a very gross example"—and it is suggested that the Official Auditor or somebody ought to take notice of it. Now, it is understood that the paper in question starts with a bias—against electricity, against the municipality, in favour of the capitalists consuming the profits. Upon all these, it would be interesting to meet them; but in the present case the points are the commercial soundness of the course taken by the Corporation in offering to supply electricity for power at 1d. per unit, and the controversial honesty of this journal with regard to it. As a matter of fact, it can be shown that the Newport Electrical Department are adopting a commercially sound principle, and that the opposing paper has trickily succeeded in giving a misleading idea as to the difference between the cost of generation and the sale price.

The cost of generation is stated at 2·65d. per unit, and that figure is emphasized. Yet who should know better than the writer in a lighting journal that the cost of generation is much higher in the summer, when the consumption is small, than in the winter, and that it is unfair to quote the summer cost as the cost of generation? "Gas Lighting" takes the cost for the summer quarter, conveys the impression to the outsider that it costs Newport 2·65d. per unit to generate electricity, and that in a spirit of unfair competition they are offering to sell at 1d. Now, as a matter of fact, the average cost of generation last year was 1·84d. per unit; this year it is believed that the total cost will work out at 1·75d. per unit. But there is this very important point also. The prices at which the Corporation could supply power were never based upon the cost at the Llanarth Street station—which is not a power station—but upon what they expect the cost to be at the new power station in Corporation Road, when completed. It is estimated that when this station is properly running, the total cost per unit will vary between 1d. and 1¼d. So that, even on the assumption that power ought to be charged on the full cost, the loss would be very small indeed.

But there is another important feature—and really it is the deciding point. Consumers of power will require their current during the day, when, though the works have to be kept going to supply current, it is possible to generate more at little additional cost. There must be labour at the works, and the capital charges are the same whether they are running with a big load or a small; and, therefore, if the Corporation can sell a large quantity of electricity during the hours when the demand for light is small, and when the extra cost will only be that expended upon fuel, oil, water, &c., which will not be more than 0·6d., it must be a profitable transaction for the Corporation to sell at 1d. per unit. The plant is there, and capital charges are going on whether it is used little or much; and a large consumption of power at 1d. per unit will help to bring down the average cost. If by the additional expenditure of 0·6d. beyond what you are bound to spend in any case you can earn 1d., you are carrying into effect a sound commercial principle. That is what the Newport Corporation propose to do; and they are only doing what practically every electrical undertaking, municipal and private, are doing in supplying power.

The Power Gas Corporation have secured a contract from the United Turkey-Red Company, Limited, of Alexandria, N.B., for the extension of their Mond gas plant by a further 3000-horse power.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	YORK	750,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	ROCHESTER	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	KINGSTON, ONT.	300,000
COLCHESTER	300,000	CRYSTAL PALACE DISTRICT	2,000,000
BIRKENHEAD.	2,250,000	DULUTH, MINN.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CATERHAM	150,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	LEICESTER	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	ENSCHEDE (HOLLAND)	150,000
HALIFAX	1,000,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
TORONTO	250,000	BURNLEY	1,500,000
OTTAWA.	250,000	KINGSTON-ON-THAMES	1,750,000
LINDSAY (Remodelled)	125,000	ACCRINGTON.	500,000
MONTREAL	500,000	TONBRIDGE	300,000
TORONTO (Second Contract Remodelled)	2,000,000	STRETFORD	500,000
BELLEVILLE.	250,000	OLDBURY	300,000
OTTAWA (Second Contract)	250,000	TODMORDEN	500,000
BRANTFORD (Remodelled)	200,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
ST. CATHERINES (Remodelled)	250,000	YORK (Second Contract)	750,000
KINGSTON, PA.	125,000	ROCHESTER (Second Contract)	500,000
PETERBOROUGH, ONT.	250,000	NEWPORT (MON.)	250,000
WILKESBARRE, PA.	750,000	TOKIO, JAPAN.	1,000,000
ST. CATHERINES (Second Contract)	250,000	PERNAMBUCO (Brazil)	125,000
BUFFALO, N.Y.	2,000,000	MALTON	150,000
WINNIPEG, MAN.	500,000	DULUTH, MINN. (Second Contract)	300,000
COLCHESTER (Second Contract)	300,000	BROCKVILLE (ONT.)	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft. TORONTO (3rd Cont.), 750,000 C. Ft

PRESERVATION OF UNDERGROUND WATER.

The Secretary of the Underground Water Preservation Association (Mr. Clayton Beadle) has issued a pamphlet dealing with the underground water supply of the country. The Association, which was originally the Kent Water Preservation Association, has been formed for the purpose of preventing the abstraction of water to the detriment of landowners, millowners, householders, and others, and for conserving the waters of any district when they are required for the use of the inhabitants thereof. It is stated that for many years certain geologists imagined the London basin to be composed of a series of chalk beds under the London clay; and these beds were supposed to be full of water and practically inexhaustible. Facts now derived from regions in or near that basin show that this is not so, and that in many cases the water is rapidly becoming exhausted. This deficiency has been almost universally attributed to lack of rain; but one of the objects of the compilers of the pamphlet is to show another cause of what has already become a disastrous state of affairs in the home counties and many other parts of the country. The report which is drawn up by Mr. Urban H. Smith, Assoc.M.Inst.C.E., on this subject is given at length, and refers to the disastrous results of depletion of the springs by pumping. Among the chief objects of the Association the following are given: (1) To suggest the best course to be adopted for preserving the water supply under the special circumstances of any particular case; (2) to suggest the best position for locating pumping-stations, with the view of doing as little injury as possible to local interests; (3) to suggest the best course to be adopted in storing, for domestic purposes, the ordinary rainfall; and (4) to take all possible steps to prevent water companies from obtaining money and powers from Parliament for the erection of pumping-stations in districts where there is a shortage of water, and where pumping operations threaten to deprive the inhabitants of the district of their natural supply.

The Conisbrough Gas Company, Limited, has been registered with a capital of £12,000, in £1 shares, to acquire the business of the Conisbro' Gas Company, Limited (incorporated in 1869); to develop and extend the same; and to produce and supply gas from oil, coal, &c., and deal in and with the residual products thereof, and, for the purposes of the Company, to erect any further machinery, apparatus, plant, &c., and adopt a certain agreement.

Reduction in Price at Southport.—Official notice has been given that, from and after the 1st prox., gas will be supplied by the Southport Corporation Gas Department of an illuminating power equal to 16 candles, and that the price to consumers within the borough will be reduced to 2s. 8d., and to those outside the borough to 3s. 2d. per 1000 cubic feet. For the present, the prices charged to consumers under the old special contracts will not be interfered with.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A year in which there was a good deal of motion, and not a little commotion, in gas circles, but not much progress, will, I surmise, be the opinion of most people who know regarding 1902. The most notable incident of the year has been the completion of the new gas-works at Granton. The works are a great advance upon anything yet seen in Scotland. But they were not the fruit of the year; they we e only the bringing to maturity of a scheme which was formulated several years ago. There will be general satisfaction at the completion and inauguration of works so important. Consequent upon the accomplishment of this, there has been the closing of the gas-works at Leith, the site of which is now for sale. In Glasgow, good progress has been made with the erection of the new gas-works at Provan; but the time for their completion is not yet due. Large extensions to the Dundee Corporation gas-works were completed early in the year, and have been working since. There have also been extensions in progress in Greenock, Dunfermline, Dumfries, Broughty Ferry, Kilsyth, Arbroath, Bothwell and Uddingston, and other places—extensions which have been required to meet increasing demands for gas. It is a disappointment to have to record that at Falkirk the Town Council have shown a disposition, since the municipal election last month, not to go on with the much needed erection of new gas works, but rather to spend more time making inquiry into possible makeshifts. Only one transfer has been carried through during the year—that at Newport, in Fife shire. Two Gas Companies were placed under the Companies' Acts; but both were small, their aggregate capital only reaching £18,000.

There was no legislation of consequence relating to gas supply during the year; only one or two measures having been passed for the increase of capital, and matters of a cognate character.

There were fourteen changes of Gas Managers; the most important of which were those of Mr. A. Yuill, of Alloa, to Dundee, and of Mr. J. W. Napier, of Carnoustie, to Alloa.

Three Gas Managers died in harness—Messrs. W. Robertson, of Campbeltown; C. Carlow, of South Queensferry; and S. Winton, of Grangemouth. The death also occurred of Mr. J. C. Adamson, of Airdrie, who, in his early days, filled the post of gas manager.

The meetings of gas managers which were held were largely attended, and profitable discussions took place at them. It cannot be said that any subjects of more than ordinary interest were brought forward; but the good the meetings did was not the least curtailed thereby, as a wider interest was manifested in the subject-matters considered.

Labour troubles were altogether absent, though there were movements among workmen, which, in more instances than one, resulted in better conditions of labour being secured.

The price of coal fluctuated but little during the year, and may be said to be now only a shade cheaper—about 3d. per ton—than it was

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GAS-FIRES.
Cheap to Maintain.

THE KING
&
Suitable for Hiring Purposes.

QUEEN.

a year ago. This price is, however, slightly higher than it was a few weeks back. As compared with the prices in 1901, there was a very substantial reduction. This circumstance allowed of the price of gas being, in many instances, reduced. This was one of the satisfactory features of the year's working, and another, which is in close relationship to it, is found in the almost universal increases in the consumption of gas which were experienced; both of which point to the continued prosperity of the great industry of gas manufacture.

A meeting was held of the Edinburgh and Leith Gas Commissioners on Monday, at which Mr. D. Purves, the Convener of the Works Committee, reported, on behalf of a Sub-Committee, that they had had a meeting that day to consider the cases of the eighteen men who had been thrown out of employment by the closing of the Leith works. They had dealt with these men in as liberal a manner as possible, and had agreed to allow them pensions, of which the maximum would be 7s. 6d. and the minimum 5s. per week, always having relation to their age, and to the likelihood of their being still able to perform some light work. These pensions would require a yearly sum of about £306. He moved that the resolution of the Sub-Committee be affirmed; and it was unanimously agreed to. Mr. R. A. Douglas asked if the Engineer could give them any explanation as to the deficiency in the supply of gas in some districts of the city, particularly in the west end. Mr. Herring, in explanation, said he was aware that there was a deficiency of gas in some districts, and that it was partly accounted for by the distributing system having been interfered with in consequence of the starting of the Granton works and the closing of the Leith works.

The position of the Edinburgh and Leith Gas Commissioners upon the subject of pensions is such that attention cannot be too widely called to it. They have obtained power to award pensions to employees of not less than twenty years' service, to an amount not exceeding an annual charge upon the gas of ¼d. per 1000 cubic feet. I am not aware of any other corporation who have boldly faced the subject of pensions in this manner. There have been inquiries in various corporations upon proposals to institute provident or old-age funds; but these have, so far as regards gas undertakings, never got into the practical stage, on account, chiefly, of the difficulty which at once arises in connection with the great fluctuation in the numbers of the workmen from season to season. If a man contributed to a fund for one season and then left the service, he would naturally want his money back. If he did not get it, an injustice would be done to him; while, if he did get it, the fund would never be able to get on to a sound basis. The Edinburgh method rises superior to any such proposal, because it does away with the workmen's contributions altogether. The workmen not having contributed, they have no claim, except upon the justice of their case or the generosity of the Commissioners. One who has been a good servant will always be generously dealt with; one who has not stayed long enough to deserve a pension, or who, having a just claim otherwise, through failure of health or the like, has not been a careful or attentive employee, will receive less generous treatment. There is thus held out to employees one of the best inducements which there can be for the giving of diligent and faithful service. I am led to make these references to the Edinburgh method of providing pensions by the circumstance that the same subject has been before a Committee of the Dundee Corporation this week, when a statement was submitted showing that the Corporation have 1332 employees, to whom they pay annually £92,270 in wages; and that there are 35 pensioners, who receive £753 a year. The members of the Sub-Committee, it is reported, while favourable to a scheme for the establishment of a benefit fund, were of opinion that no contributions should be paid by the Town Council, but that any pension fund should be made up out of rateable deductions from the employees' salaries and wages. They agreed to recommend accordingly to the Town Council. In this the Dundee Gas Committee have arrived at a decision the direct opposite of that which has been deliberately adopted in Edinburgh. It is not said that the gas-works employees are included in the proposed Dundee scheme. I assume that they are; but it does not matter much whether they are or not—the subject dealt with is the provision for the retirement of employees.

The community of Dundee were startled yesterday by the discovery that a family of four persons—a woman named Keenan, her grown-up son, and two children—had been suffocated by gas. They were last seen on Saturday, and then, for five days, there was no sign of movement about the house. This circumstance did not arouse suspicion, because it was thought that they had gone from home. The son states that on Wednesday night he came to himself, got out of bed, and went to the kitchen to take a drink of water. He then saw his mother and the children in bed, but was overcome with weakness and fell to the floor, where he lay till next day (Thursday) when, again recovering consciousness, he was able to make his way to a neighbour's abode. A woman accompanied him back to the house, where it was found that both the children were dead and that Mrs. Keenan was unconscious. A police constable was called, who was able to restore Mrs. Keenan to consciousness. She was then taken to the Royal Infirmary for treatment. The latest information regarding her is that she is still in a precarious condition, and that her son is out of danger. Mr. A. Yuill, the Gas Manager, has been investigating the circumstances on behalf of the Corporation. It appears that on Wednesday a hairdresser in Union Place, Lochee, reported that there was a scarcity of gas in his shop, and that on Thursday forenoon workmen were sent to attend to the matter. They cut off the gas supply from the tenement, and made an examination of the pipes and fittings, but failed to find anything wrong. They then turned on the gas again. Meanwhile, the youth Keenan had emerged from the house above; and his statement led to the upper flat being also examined. It was found that the service-pipe had been wrenched away from the meter, and also that the outlet-pipe from the meter had been broken off. The inlet and outlet connections were found behind the meter. The gas was rushing from the broken service-pipe. Mr. Yuill is preparing a detailed report upon the matter, which will probably throw light on this mysterious case.

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The Gas Committee of the Perth Corporation on Monday considered reports by Mr. W. B. M'Lusky, the Engineer and Manager, upon some proposed improvements in the Corporation Gas-Works, these improvements being, in reality, a carrying out of the arrangements which he stated in his paper read before the North British Association of Gas Managers last July were in contemplation. In his reports, Mr. M'Lusky states that, in his opinion, they ought to be able, upon emergency, to accommodate in their own railway sidings not only the full coal-waggons which are delivered daily, but also the empty trucks which are waiting for despatch; and, further, he considers that the Commissioners are morally bound to do all the shunting of the waggons after the coal has been delivered, although at present they have to rely upon the Railway Companies to do that work. Further, the present temporary arrangement for discharging coal from trucks, and the screening and loading of coke, is clumsy and unprofitable, and is out of harmony with the new works at Perth, part of which are fitted with modern labour-saving appliances. As a matter of fact, the present expedient of attempting to serve machinery by hand labour is not only wrong in principle, but most expensive and inconvenient in its application. While increasing the wear and tear of the present plant, it also results in an increase on cost charges, in keeping the machinery running with a light load. Mr. M'Lusky believes that his proposed machinery would return the entire initial cost of it, in reduced working expenses, within seven years. Moreover, it is so simple in design and construction that all necessary repairs and maintenance could be effected by their own workmen, under his direction. The estimate of the cost is £6020, which includes £3900 for coal and coke handling plant, £1030 for coke-handling plant and railways, £250 for extensions of railway sidings, £300 for paving and foundations, and £540 for contingencies. The outlay would yield a handsome return. On the 23rd of December last year, he recommended the purchase by the Commissioners of twenty waggons for their own use. He begged again to draw attention to the fact that an expenditure of £1200 on this plant would be repaid within three years, as at present they pay a sum of £400 annually for waggon hire. The tenders for a locomotive shunting crane ran from £605 to £635. As to the town department of the undertaking, Mr. M'Lusky reported that, in the course of the present week, the gas-works plant would be all cleared off the site of the old works in Scott Street, and that the work of meter repair, pipe-fitting, and stove repair, carried on there, was hampered to a considerable extent, which caused unnecessary expense. Moreover, the uninviting appearance of the place might check the progress of the stove trade, so far as new business was concerned. He begged to suggest, for the consideration of the Committee, the advisability of obtaining a central shop in the city—temporarily at least—for the exhibition of gas-cookers and gas-fires, and for the display of the most efficient and economical systems of gas lighting. He also wished to have the direction of the Committee upon the larger question of the reconstruction of the workshops and show-rooms at Scott Street. That central workshops were required was, of course, apparent. A permanent showroom and office had also become a necessity. The Committee discussed these reports, and then resolved that, as the expenditure involved in the proposals exceeded the borrowing powers of the Corporation, the reports be sent back to Mr. M'Lusky to consider which items should be deleted.

The Corporation of Dunbar, at a special meeting this week, agreed to proceed with extensions to the gas plant, so as to enable them to provide a better supply of gas to the Broxmouth district, and to erect a dwelling-house for the Manager, at a cost of about £2000.

The Pitlochry Gaslight Company have completed extensions at the gas-works, to plans prepared by Mr. J. Kermack, the Manager, and revised by Mr. W. M'Crae, of Dundee, at a cost of about £1600. The works include the erection of a retort-house and coal-store, annular condensers, a scrubber, two purifiers, and a gasholder.

The Stirling Water Commissioners yesterday paid a visit of inspection to their reservoirs at Touch, where they have had improvements effected upon the outlet-pipe and the embankment of No. 2 reservoir. A new well has been built within the reservoir, from which the water will be drawn at about 12 feet from the surface of the ground; a new outlet-pipe of larger diameter has now been laid; and the embankment has been strengthened. The cost of the works has been about £1300. The Commissioners found everything to be in perfect order.

In the course of this week, the Water Committee of the Arbroath Town Council met and considered the resolution adopted at the public meeting of ratepayers, calling for a plebiscite upon the subject of the water supply before proceeding with the promotion of a gravitation water scheme, to which I referred last week, and agreed not to consider it, as they have simply to carry out a remit made to them by the Town Council at their last meeting. The Water Committee of the Dundee Corporation have also considered the application by the Corporation of Arbroath for a supply of water from Dundee reservoirs, and have agreed that negotiations shall be continued, a conference between the two bodies being proposed.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 27.

Sulphate of Ammonia.

Although the holidays were close at hand, it was evident at the beginning of the week that requirements were by no means filled, and brisk buying continued right up to the end of the business days. In consequence, prices were not only fully maintained, but even hardened slightly, and now stand at £11 16s. 3d. to £11 17s. 6d. per ton f.o.b. Hull, £11 18s. 9d. to £12 f.o.b. Liverpool, and £12 to £12 2s. 6d. per ton f.o.b. Leith. The buying was chiefly due to the necessity of covering December contracts, and was therefore largely directed to parcels for immediate delivery. Forward business was not in evidence though the position is unaltered.

THE
MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
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The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
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Nitrate of Soda.

This is firm at 9s. per cwt. for ordinary, and 9s. 3d. for refined quality.

LONDON, *Dec.* 29.

Tar Products.

The markets remain quiet, and there is really nothing of importance to advise. Crude carbolic is very dull, and prices have a downward tendency. The demand for pitch continues strong, especially for early delivery. Creosote continues very firm in London; but there is rather more offering in the north of England. The position of benzol remains unchanged. There is rather more inquiry for 50-90 per cent. forward. Solvent, toluol, and anthracene remain very dull; and prices are purely nominal.

The average values during the week were: Tar, 21s. to 25s. Pitch, London, 57s. 6d. to 59s. 6d.; east coast, 55s. to 56s.; west coast, 54s. to 55s. Benzol, 90 per cent., 10d.; 50-90 per cent., 8¼d. to 8¾d. Toluol, 8d. Crude naphtha, 3¼d.; solvent naphtha, 8¾d. to 9⅛d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅞d.; North, 1⅞d to 1½d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60 per cent., 1s. 7½d. to 1s. 8d. Naphthalene, 35s. to 55s.; salts, 23s. 6d. to 26s. 6d. Anthracene, "A" quality, 1½d. to 1¾d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market continues very firm indeed, especially for forward delivery. The Gaslight and Coke Company are not sellers for prompt, and quote £12 7s. 6d. for January-April. Another large gas company declined £12 3s. 9d. for January-March. In Hull, business has been done at £11 17s. 6d. for early January; while for forward, makers ask rather more money. In Leith, there is a very strong demand for January-June; and prices are very firm. A little business was reported at £12 to £12 1s. 3d. for prompt; but full particulars have not transpired. In Liverpool, there is not much business doing at the moment. Several small parcels are reported to have been sold at from £11 17s. 6d. to £11 18s. 9d. for prompt shipment.

Under the supervision of Mr. W. Ford, the Gas Engineer to the Stockton-on-Tees Corporation, the Keith system of high-pressure gas lighting has been introduced in the Shambles in that town. Four lights, each of 600-candle power, have been fitted up along the side avenues, and three 1000-candle lights along the centre. With Stockton gas, a light equal to 1000 candles costs 1d. per hour.

Messrs. Joseph Taylor and Co., of Bolton, have received the order for a 1½-inch solid plate lead saturator, with 2-inch bottom, of their latest build, with double detachable ammonia pipes and detachable acid pipe, and solidly braced with pitch-pine laggings, which was specified by the Portsea Island Gas Company, through their Engineer, Mr. J. D. Ashworth, in connection with the new sulphate of ammonia plant to be erected by Messrs. C. & W. Walker, Limited, noticed in the "JOURNAL" last week.

LANCASHIRE COAL TRADE DURING 1902.

A generally steady business has been doing in most descriptions of fuel during the past twelve months, and the pits, with the exception of short periods of curtailed summer output, have maintained an average of about four to five days a week. As a rule, the output has been moving away without much difficulty, and little in the way of stocks has accumulated at the collieries. As to prices, they have been maintained at a fairly remunerative basis for house-fire coal; but in the lower qualities of fuel there has been a further easing down upon the reduced prices of last year, which has perhaps been rather seriously felt by collieries in the relatively low rates they have had to accept for slack. The chief complaint has, however, been that wages have remained at a disproportionately high point, considering the great reduction in prices since the miners secured their maximum rate of remuneration. Notwithstanding the reduction of 10 per cent. made during the past year, it is still contended that the miners are receiving a rate of wages not warranted by the present price of fuel.

The collieries started the year with a large weight of unexpected house-fire coal orders on their books, and prices strong at full list rates, averaging at the pit mouth about 15s. 6d. for best Wigan Arley, 13s. 6d. to 14s. for seconds Arley and Pemberton 4-feet, and about 12s. 6d. for common sorts of house-fire coal. At the close of the year, trade assumed a steadier tone, with prices generally firm on the basis fixed by coal-owners in October.

The settlement of the gas coal and locomotive fuel contracts involved protracted negotiations, especially with regard to the usual supplies to the railway companies. When the gas coal contracts had to be dealt with, it was recognized by colliery owners, who the previous year had reduced their basis prices 2s. 6d. per ton, that a further downward move would be necessary. An arrangement was, however, come to by the associated Lancashire gas coal collieries not to give way more than 1s. as a sort of general basis, or 1s. 6d. per ton as a special concession under exceptional conditions or for some of the very inferior sorts of gas coal. In this they had the co-operation of most of the gas coal collieries. As a rule, this understanding was fairly adhered to, and the following represented about the basis per ton upon which contracts were finally settled: Best screened Wigan Arley gas coal, 10s. to 10s. 6d.; screened Wigan 4-feet, 9s. to 9s. 3d.; gas nuts, 8s. and upwards; and slack suitable for gas making, from about 7s. 6d. upwards at the pit.

The lower descriptions of round coal used for iron making, steam, and general manufacturing purposes, except so far as requirements for common house-fire sorts caused some restriction of supplies during the winter months, have been generally plentiful, with steadily weakening prices. The not more than indifferent condition of the principal coal-using industries necessarily had a more or less depressing effect upon this branch of the coal trade; and the reductions which were necessary in renewing the gas coal and locomotive fuel contracts rendered it inevitable that steam and forge coals would have to follow.

AUTOMOBILE CLUB NEW PREMISES, PICCADILLY.

ALL the Cooking Apparatus and Hot Water Installation for the above were supplied by

R. & A. MAIN, Ltd.,

COOKING AND HEATING ENGINEERS,

LONDON:
214, ST. JOHN STREET, E.C.

GLASGOW:
26, WEST NILE STREET.

At the commencement of the year, good ordinary qualities of steam and forge coal were to be bought at about 9s. to 9s. 6d. per ton at the pit mouth. But as the season approached for the renewal of contracts, there was a gradual easing in prices, and for short contracts there were sellers at as low as 7s. 9d. to 8s. 3d. per ton at the pit. The considerable shipments of coal to America during September and October, and the advance in house-coal descriptions, had a hardening effect upon steam and forge qualities. Prices consequently got back to something like 8s. 6d. to 9s. per ton; and for the better qualities this has since been tolerably well maintained, Where, however, collieries have perhaps most felt the depression in rates during the year has been the proportionately very considerable reduction in the price of slack. On the other hand, there has been an increased demand for steam purposes, in connection with the numerous new electric power installations in various parts of the country; and latterly there have been some large shipments of slack to the United States for gas-making purposes. The result has been a fluctuating state of the market, with, however, a gradual downward tendency in prices, representing a drop of 1s. to 1s. 6d. per ton as compared with the commencement of the year. Some of the commoner sorts of slack could be bought as low as 3s. 9d. to 4s. per ton, and medium sorts at about 4s. 9d. and 5s. The best qualities of slack have shown the least giving way; and at times there had been rather a scarcity of supplies. But they also had to follow the downward tendency of the market. At the close of the year, prices steadied somewhat; and at the pit they averaged about 5s. 6d. to 6s. for good medium sorts, and 6s. 6d. to 7s. for best, with a rather more confident tone in the market generally.

COAL TRADE REPORTS.

Northern Coal Trade.

The holiday interruption is influencing the coal trade in the last few days; but the production has been full, and deliveries must have given good stocks. At present, the output is below the average, and will be to some extent interrupted for a week. Best Northumbrian steam coals are firm at 11s. 6d. per ton f.o b., steams are 10s. 3d. to 11s. 3d., and steam smalls are about 5s. 6d. The Durham coal trade is now passing the height of its fullest demand, though the bright weather limits the consumption a little. Gas coals are steady and rather scarce for early delivery; so that for such the price is firm and high—10s. per ton f.o.b. being a current quotation, though contracts are still being negotiated at prices from about 8s. 10½d. to 9s. when delivery extends over a period of some duration. Though the production of gas coke is now at its heaviest, the price is maintained, and the demand seems fairly good. For very early delivery, from 13s. 6d. to 14s. per ton f.o.b. is still the quotation for best quality.

Scotch Coal Trade.

The output is still being all taken up, and coalowners report that they are well booked ahead, which does not seem to coincide with the prevailing outcry about so large a number of workmen being unemployed. Prices are firm; and prospects are said to be good. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 11s. to 11s. 3d. There will be no official issue of prices for the next two weeks. The shipments for the week amounted to 235,876 tons—an increase of 23,429 tons upon the preceding week, and of 39,446 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,856,683 tons—an increase of 1,190,057 tons upon the same period of last year.

Incandescent Gas for Church Lighting.—Nine of the places of worship in Mossley have recently had their lighting very much improved by the introduction of incandescent burners; and in every case the greatest satisfaction has been expressed. The work has been done by the officials of the Gas Committee of the Corporation, under the supervision of Mr. H. J. Robinson, the Gas Engineer.

Breaking into a Gas Office.—At the Willenhall Police Court recently, Samuel Rhodes was charged with breaking into the counting-house of the Gas Company, and stealing £1, the property of Mr. W. G. S. Cranmer, the Manager. Mr. Cranmer said entrance was effected by means of breaking the lavatory window and pushing back the catch. The money taken was from a drawer in his private office, and was composed of sixpences and threepenny pieces. Prisoner, who said he knew nothing about the matter, was committed for trial at the next Quarter Sessions, bail being refused.

The Forcible Removal of Water-Pipes by the Eton District Council.—With reference to the dispute between the Eton Rural District Council and the Rickmansworth Water Company regarding the unauthorized laying of some pipes within the area over which the Council have jurisdiction (*ante*, p. 1565), it seems that the Company are showing no great alacrity in submitting to all the demands of the Council. These demands were an unqualified apology, the payment of the damage said to have been caused, and a promise that they would not take more water out of Bucks than they brought in. The Company, however, wrote explaining that they were not aware the road in question was under the control of the Council; and that as the requirements of the district they wished to supply were urgent, they did not think it possible that any objection could be taken by the road authority to the laying of the small length of main necessary to complete the connection. As to the damage to the surface of the road, the Company stated that they were quite prepared to make this good. On coming before the Council at their last meeting, this letter was regarded as unsatisfactory; and the Clerk was instructed to reply to it accordingly. The Company have since written again, expressing their regret at the "unfortunate mistake" which was made; and the Council have resolved that, when the expenses of the recent proceedings have been disposed of, they will consent to the extension of the Company's mains, provided an effectual undertaking is given that the Company will not take more water out of the county than they bring in.

FOREMOST FOR 1903

PURIFIERS & VALVES

(PICKERING'S PATENT).

INCLINED RETORTS

(DIDIER SYSTEM).

WILLEY & CO., LONDON & EXETER.

Darlington Gas-Works Extensions.—The Darlington Gas Committee are arranging to visit Tynemouth, Shields, Sunderland, and Middlesbrough, in order to obtain information which will guide them in deciding what system of carbonizing to adopt in the new retort-house which they are about to erect.

Accrington Gas and Water Board.—At the last meeting of the Accrington Gas and Water Board, Mr. Charles Harrison, the General Manager, submitted a report recommending the closing of the Accrington Gas-Works from April to October each year. This was agreed to. It is estimated that the closing of these works for six months will effect a saving of £1000. During the portion of the year referred to, all the gas required will be made at the Great Harwood works, which are much more up to date than those at Accrington.

The Worksop District Council and the Water-Works.—Mr. J. C. Pottinger, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry in the Town Hall, Worksop, into the application by the Urban District Council for authority to purchase the undertaking of the Worksop Water Company. Mr. S. H. Featherstone, the Clerk to the Council, stated that the population of Worksop at the last census was 16,112, and the assessable value £52,232. The outstanding loans amounted to £48,418, while a further sum of £4500 had been sanctioned; making a total of £52,918. Evidence was given in favour of the application, to which there was practically no opposition. Subsequently, the Inspector visited the water-works, and made a minute examination of them.

Liability for the Maidstone Explosion—The Maidstone Urban District Council have received from Mr. Arthur Ventris, Assoc.M. Inst.C.E., a report on the damage done to the bridge by the recent gas explosion. After giving details, he stated that the stability of the structure had been in no way affected. The Highways Committee recommended that Mr. Ventris should be instructed to prepare a specification and estimate of the work required to completely repair and restore the bridge, and further, that the Gas Company should be informed that they will be held liable for all the damage done by the explosion, and will be looked to by the Council to refund not only the cost of repairing the bridge, but also all incidental expenses incurred in consequence of the explosion.

Litigation over a Halfpenny.—An extraordinary summons by the Manchester Corporation Gas Department against a gas consumer was heard last Tuesday. The latter was summoned for neglecting to pay a gas bill, amounting to 6s. 1d. It was stated that the amount was made up of two items, one of which was 500 cubic feet of gas at 2s. 9d. per 1000 feet. The Gas Department, it transpired, charged 1d. for the fraction, and rendered the item as 1s. 5d. instead of 1s. 4½d.; but the defendant objected to the extra halfpenny. He tendered 6s. 0½d., which was refused, and afterwards paid the full amount charged, but not until the summons had been taken out. An order was asked for against the defendant for costs; but the Magistrates declined to make it. The case was accordingly dismissed.

Water Supply in the Whitehaven Rural District.—At the last meeting of the Whitehaven Rural District Council, a scheme for supplying the southern section of the district with water, at an estimated cost of about £13,000, was approved.

Pontefract in Darkness.—Last Wednesday evening, Pontefract was thrown into darkness owing to the sudden failure of the gas supply. The explanation given was that an outlet-valve had not been turned on as usual, so as to give the town an extra supply. The defect was remedied in 15 minutes, and shopping was resumed.

Natural Gas in Sussex.—In reply to an inquiry addressed by the Clerk to the Hailsham Parish Council to the Natural Gas Company at Heathfield, as to the likelihood of their being able to light Hailsham with gas, he was informed by the Company's Engineer that they expected to be in a position to supply gas early in the New Year, and would be glad to arrange with the Council for the public lighting.

Improving Public Gas Lighting in London.—The policy of improving the gas lighting of the streets is being widely adopted in the Metropolitan Boroughs. Last week, action at St. Pancras, Hackney, and Chelsea was reported in the "JOURNAL" pages. The Kensington Borough Council last Tuesday resolved that the gas-lamps in ten roads should be fitted with "Kensington" pattern lanterns and incandescent burners, and that the gas-lamps in four other roads should be provided with incandescent burners, at an estimated cost of £224 16s.

Reduction in Price at Sandwich.—Mr. T. E. Pye, the new Manager of the Sandwich Gas-Works, has lost no time in making the consumers acquainted with the capabilities of gas and the value of the residuals obtained in its manufacture. In a circular he is issuing, he sets out in detail what a pennyworth of gas will do when it is carefully used, and prefaces this information with the announcement of a reduction of 5d. per 1000 cubic feet (from 5s. to 4s. 7d.) to ordinary consumers, as from the 1st prox., with a commensurate concession to those taking their supply through slot meters, which will make their charge 5s. The circular furnishes some very useful hints, which the consumers would do well to profit by.

The Local Government Board and Permanent Works.—The "Local Government Journal," referring to the fact that local authorities are empowered by the Public Health Act, 1875, to borrow money for permanent works, including in this expression any works of which the cost ought, in the opinion of the Local Government Board, to be spread over a term of years, points out that it does not follow that all works which are in the ordinary sense permanent can be the subject of a loan. "In fact," says our contemporary, "the Whitehall Board require to be satisfied not only as to the durability of the works proposed by Local Councils, but as to the permanence of the benefit to be derived therefrom; and where the latter element is doubtful, they discourage the borrowing of money for a term of years. The Board also set their faces against the mortgaging of rates for anything in the nature of repairs to buildings or works, or for the costs of litigation, temporary hospitals, retorts in gas-works, or manual fire engines."

GAS-FIRES.

Richmond's

greet the

New Year

with

Warmth.

LONDON,
WARRINGTON,
STRATFORD,
&c.,
&c.

Lynton Water Supply.—The Lynton Urban District Council met on Monday evening last week to consider a report from the Water Committee, who unanimously recommended the Council to adopt the scheme for a new water supply prepared by the Surveyor (Mr. W. H. Chowins). He proposes to lay a new iron main from the intake at Cherribridge along the public road, through Lyn Way, to the town; pressure filters being provided at Barbrook. After some discussion, it was, on the motion of Mr. Pulkinghorne, seconded by Mr. Hole, unanimously resolved to adopt the report; and the Surveyor was requested to visit various towns where pressure filters are in operation, and to proceed with the necessary drawings, &c., for the new works.

Examination of London Water.—The Water Committee of the London County Council have reminded the Council that the time for which they authorized the continuance of analyses of water from the Thames and the Lea above the Metropolitan Water Companies' intakes, and of water drawn from the Companies' mains, will expire on the 31st inst.; and the Chemist (Dr. Frank Clowes, F.I.C.) has asked for further instructions. The Committee say the experience of the past fully justifies the Council's action in having undertaken this work in the interests of the consumers, and possibly the Board which is about to be constituted as the Water Authority for London will determine to have made such an examination as has been carried out by the Council. As the Committee consider it might be advantageous for the new authority to have handed to them a continuous record of examination, they have asked the Council to give authority for the Chemist's work to be continued, if necessary, until March 31, 1903. Provision for the examination has been made in the estimates for the current financial year, and the Committee have recommended that, unless instructed to the contrary, the Chemist shall continue his examinations, at an expenditure of £27 a week, until the date named.

Opposition to the Oldham Bill.—At the last meeting of the West Riding Rivers Board, reference was made by the Chairman (Alderman C. G. Milnes Gaskell) to the Bill of which notice has been given by the Oldham Corporation to enable them to purchase the Deanhead reservoir and construct two others below it. He pointed out that it was proposed to deal with these three reservoirs, to tunnel through the watershed, and to take two-thirds of the whole of the water—leaving only one-third for compensation purposes—into another county. That was to say, Oldham intended to divert an amount of water, the total storage of which was 186 million gallons, to their own reservoirs in the Saddleworth Valley. This was surely an exceedingly serious matter for the Yorkshire towns in the neighbourhood—towns which, like Wakefield, were obtaining their supplies from reservoirs in the immediate neighbourhood of Deanhead. It was also a matter for serious consideration for growing Yorkshire towns. Their duty, however, lay first with the rivers. He concluded by proposing that a petition be presented to Parliament praying to be heard against the Bill, in so far as it proposed to convey the water of certain streams and places of the West Riding into Lancashire. The proposition was agreed to.

Extension of Incandescent Gas Lighting at Birkdale.—So much satisfaction has been given by the partial adoption of incandescent gas-lighting in Birkdale by the Birkdale Urban District Council, and the improvement has been so noticeable, that it has been decided to extend the system by fitting the whole of the street-lamps with incandescent burners as early as possible.

Soyland New Reservoir Defective.—It was reported at the last meeting of the Soyland District Council that the new reservoir which was opened a few weeks ago was defective, and that the water in it had fallen 2 ft. 3 in. in a fortnight. The Council passed a resolution expressing surprise and alarm at the intelligence, and calling upon the Engineers to see that the leak was promptly remedied.

The Dangers of Acetylene.—At Birmingham, last Friday week, an inquest was held on the son of a local bank manager, named Walker, who met his death as the result of an explosion of acetylene. The youth had seen some instructions in a paper as to the use of this gas for magic lanterns, and made the necessary cylinders; but he failed to perforate the inner one properly. While showing his lantern, a violent explosion occurred. The deceased sustained serious injuries to his face, to which he succumbed. A verdict of "Accidental death" was returned. An acetylene apparatus exploded recently in a laundry in the Rue de la Réunion, Paris, and nine persons were injured, two of them seriously. A third accident occurred last Tuesday at Sheffield, by which two persons were badly injured. A master joiner, who used acetylene as an illuminant, was engaged, in company with a lad, in cleaning the apparatus, when, without the slightest warning, there was a loud report, followed by a flash. Both people were injured about the head—the man very severely; but no damage was done to the shop.

Depletion of the River Lea.—The Rivers Committee of the London County Council stated at last Tuesday's meeting that their attention had been directed to a report by the Engineer of the Lea Conservancy Board (Mr. C. N. Tween), which contained some interesting figures showing the reduction in the quantity of water in the river and its tributaries. It appeared from gaugings taken at Feilde's Weir between the intakes of the New River and East London Water Companies that the mean daily flow for the month of October last was 10¼ million gallons; for the first ten months of this year, 20½ million gallons; and for the first ten months of each year for the past 20 years (1882-1901), 82¾ million gallons. The Committee reported that certain tributaries of the river were dry. The report of the Official Water Examiner for October last showed that the average daily quantity of water abstracted during the month by the New River Company from the Lea above Feilde's Weir was 16,865,499 gallons; while the average daily quantity taken by the East London Company from below the weir and from storage was 6,721,139 gallons. No particulars were given as to what proportion of the latter quantity was taken from storage; but there seemed to be no doubt that, except for a small quantity required for navigation purposes, the Water Companies abstracted all the water of the river during the month in question.

THE
VERY LATEST
DESIGNS
IN
GAS-FIRES

PARKINSON AND
W. & B. COWAN, LTD.
LONDON, EDINBURGH,
BIRMINGHAM, MANCHESTER,
SYDNEY.

Winding Up of the Coventry Lighting Company.—A meeting of the shareholders of the Coventry Lighting and Engineering Company, Limited, was held at Coventry on Monday last week, for the purpose of considering a resolution that the Company should be voluntarily wound up. Mr. H. W. Robinson presided. A balance-sheet showing the Company's position on the 30th of September was presented. The loss on the fifteen months' trading amounted to £2719 10s. 6d., which, with the cost of the liquidation of the old Company and reconstruction, made a deficiency of £3970 14s. 5d. The Chairman, in moving the resolution that the Company be wound up, said that, in his opinion, the causes of failure were lack of working capital, the unsaleable nature of the stock-in-trade, heavy interest and establishment charges, and an insufficient turnover. The Directors had done all they possibly could to restore the business, but without success. They had also tried to sell it as a going concern, but were unsuccessful in that; and there appeared to be no alternative but to wind up the concern. Mr. W. Lee seconded the motion, and said this was the most straightforward course to take. Alderman Andrews remarked that there seemed to be something in the atmosphere at Coventry that made it impossible to run a joint-stock business successfully. He agreed with the proposal. The Chairman mentioned that the Directors would be the heaviest losers. The motion was carried unanimously. Mr. A. J. Cudworth, of Birmingham, was appointed Liquidator.

According to a telegram from Caracas published by the "New York World" last Saturday, the stress of the blockade resulting from the trouble in Venezuela is beginning to be felt there. Fuel is becoming scarce, and the town must soon be in darkness, there being very little coal for making gas or generating power for electricity.

It will be seen by an announcement which appears elsewhere, that the New River Company are inviting applications for an issue of £250,000 of 3 per cent. debenture stock "D;" being part of the sum of £1,000,000 authorized by their Act of 1897. The reserve price is £97 per £100 of stock, which will be redeemable at par after 25 years from the date of issue. This is a trustee stock.

On Monday last week, Mr. James R. Lee (Messrs. George Orme and Co.) was installed W.M. of the Imperial George Lodge No. 78, held at the Assheton Arms Hotel, Middleton (Lancs.).

The total liabilities of Messrs. J. & J. W. Pease, the well-known bankers of Darlington, who have recently executed a deed of assignment, amount to £1,268,031; the total deficiency being estimated at £705,827, after deducting £562,203 held by secured creditors. Among the creditors are the Weardale and Shildon Water Company, for £17,335.

During the autumn session (Oct. 16 to Dec. 18), the following Bills passed through the various stages and received the Royal Assent: Gas and Water Orders Confirmation Bill (No. 1), Glasgow Corporation (Water and General) Order Confirmation Bill, Lanarkshire (Middle Ward District) Water Order Confirmation Bill, London Water Bill, Water Provisional Order Bill. The Glasgow Order and the London Water Bill reached their final stage on the last day of the session.

At the annual meeting of Tubes Limited, held in Birmingham on the 23rd inst., under the presidency of Mr. Arthur Chamberlain, the trading account showed a loss of £26,304, to which had to be added other losses on capital account, which had been placed on the balance-sheet. Notwithstanding the heavy drawbacks disclosed, the Director s expressed the belief that the business was capable of paying its way. The Chairman, in moving the adoption of the report, said the Directors now asked the shareholders to reduce the valuation of the stock from £73,000 to £30,000, as though it was taken at or under cost price, they could not, in present circumstances, hope to realize such a figure. Further, they proposed to write down the valuation of their St. Helens works from £17,500 to £7500. By writing off these amounts, they had added to their trading loss of £26,304, a capital loss of £43,000; but the latter was purely a matter of book-keeping. They had made no alteration in the large item of £757,641 for goodwill and patent rights. This year they had closed the Credenda factory, and this he was sure would improve the Company's position next year though it had been a cause of loss this one. They had to pay for being in a business which at one time made 50 per cent. on its turnover.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

ENGINEER AND MANAGER. Reading Gas Company. Jan. 12.
OUTDOOR INSPECTOR. Mitcham and Wimbledon Gas Company. Jan. 12.
STOKER. Freestone, Burton Latimer.
WORKING FOREMAN. Freestone, Burton Latimer.
WORKING FOREMAN. Irthlingborough Gas-Works.

SITUATIONS WANTED.

TRAVELLER IN GAS-STOVE TRADE. Howland, Faversham.
WORKING MANAGER. Watson, Shepton Mallet.

GAS ESCAPE INDICATOR FOR SALE (Patent). Medd, Twickenham.

GAS-WORKS TO LET. Burton, *via* Carnforth.

MEETING OF COMPANY.

RIDDINGS DISTRICT GAS COMPANY. Jan. 16.

PLANT, &c. (Second-Hand), FOR SALE.

PURIFIERS AND CONNECTIONS. Wright, London.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, &c. Firth Blakeley, Dewsbury.

PLANT, &c. (Second-Hand), WANTED.

METERS (DISUSED), BRASS, COPPER, LEAD ASHES, &c. Smith, Bradford.

SALES OF STOCKS AND SHARES.

BARNET GAS AND WATER COMPANY. Jan. 13.
BRIGHTON AND HOVE GAS COMPANY. Jan. 13.
GUILDFORD GAS COMPANY. Jan. 13.
HORLEY GAS COMPANY. Jan. 30.
KINGSTON-ON-THAMES GAS COMPANY. Jan. 13.
NEW RIVER COMPANY. Jan. 15.
SOUTH METROPOLITAN GAS COMPANY.
SHREWSBURY GAS COMPANY. Jan. 30.
TOTTENHAM AND EDMONTON GAS COMPANY. Jan. 19.

TENDERS FOR

ASH-PANS AND FURNACE FITTINGS.
SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

COAL.
COPENHAGEN. 100,000 tons. Tenders by Jan. 19.

GASHOLDER.
SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

GASHOLDER TANK (Steel).
SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

GOVERNOR AND CONNECTIONS.
SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

GOVERNOR AND METER HOUSE, &c.
SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16.

HYDRAULIC MAINS, ASCENSION PIPES, &c.
SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

METERS.
SOUTH MOLTON GAS DEPARTMENT (Station). Tenders by Jan. 16.

PURIFIERS.
SOUTH MOLTON GAS DEPARTMENT. Tenders by Jan. 16

RETORT MOUTHPIECES.
SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

STEEL AND IRON WORK (Stage Floor, &c.).
SHEFFIELD GAS COMPANY. Tenders by Jan. 5.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.
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OLD BROAD STREET,
LONDON, E.C.
ANDREW STEPHENSON, AGENT. All communications RE OXIDE to the COMPANY as above.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.
HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.
MELROSE CYCLE COMPANY, COVENTRY.

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BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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Twice as Rich as Bog Ore.
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Can be Exchanged for Spent Oxide.
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BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

MR. S. J. HOWLAND, late with Messrs. John Wright and Eagle Range, Limited, desires position as TRAVELLER. Good References.
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SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
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H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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WANTED, re-engagement as Working MANAGER or FOREMAN. Practical Carbonizer, Mechanic, Gas-Fitter, Main and Service Layer, &c. Total Abstainer. Excellent Testimonials and References.
Address G. WATSON, 19, Zion Hill, SHEPTON MALLET.

WANTED, Gas Stoker for Small Works. Willing to make himself generally useful. Will be required to take alternate day and night shifts.
Apply, stating Age and Wages required, to F. T. FREESTONE, Alexandra Street, Burton Latimer, KETTERING.

WANTED, a Working Foreman. Must be a good Carbonizer, acquainted with the usual routine of a Gas-Works, and competent to lay Mains and Services. House, Garden, Coal, and Gas free.
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WANTED, a Working Foreman for Gas-Works. Must be used to Regenerator Furnaces, and General Gas-Works Routine. Cottage on Works provided, with Gas and Coal.
Apply, stating Wages required, Testimonials, and Experience, to HARRY R. WIMHURST, Gas-Works, Irthlingboro', NORTH HANTS.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.
THE above Company require a thoroughly competent OUTDOOR INSPECTOR. He must be under 35 Years of age, and have had previous experience. Salary to commence at about £100 per annum.
Applications, by letter, stating Age, Qualifications, Experience, and Salary required, accompanied by *copies* of recent Testimonials, to be sent in before the 12th of January next, addressed to BENJAMIN GREEN, Secretary and Manager, Gas-Works, Mitcham, SURREY.

READING GAS COMPANY.
GAS ENGINEER AND MANAGER.
THE Directors of the above Company require the services of an experienced GAS ENGINEER and MANAGER.
He must not be less than Thirty nor more than Forty-Five Years of Age, and must have had a thorough practical experience of Gas Manufacture in all its Branches, including the Design and Construction of Modern Gas-Works Plant.
Applications (which will be treated in confidence), stating Salary required, Age, and giving a detailed account of previous Training and Experience, together with *copies* of not more than Four Testimonials, should be sent to me on or before Monday, Jan. 12, 1903, endorsed "Application for Engineer."
Canvassing will disqualify.
By order,
ARTHUR H. CANE,
Secretary.
7, King Street, Reading,
Dec. 9, 1902.

TO BE LET—The Burton Gas-Works for a Term of Years. Possession March 28, 1903. Tenders taken to Jan. 20.
Apply L. H. NUTTER, Burton, *vid* CARNFORTH.

WANTED, old Disused Gas-Meters, BRASS, COPPER, and LEAD ASHES for Cash.
J. SMITH, Broker, Canal Road, BRADFORD.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
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Apply to G. MEDD, 80, Queen's Road, TWICKENHAM.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

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LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are prepared to receive TENDERS for the supply and delivery of 100,000 Tons of best GAS COAL from the beginning of April, 1903, until the end of December, 1903.
The Magistracy reserve the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Kjöbenhavns-Belysningsvœsen, Vestre-Boulevard, Köbenhavn B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Magistratens, 4de Afdeling, Det nye Raadhus, Köbenhavn B, before the 19th of January, 1903, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.
THE MAGISTRACY OF COPENHAGEN.
Dec. 23, 1902.

BOROUGH OF SOUTH MOLTON.
GAS-WORKS EXTENSIONS.
THE South Molton Town Council invite TENDERS for the delivery and erection of—
TWO PURIFIERS.
STATION METER.
GOVERNOR AND CONNECTIONS.
GASHOLDER AND STEEL TANK.
ERECTION OF SHED FOR PURIFIERS.
ERECTION OF METER AND GOVERNOR HOUSE.
The Plans and Specifications may be seen on any week day (Wednesdays excepted) at the Office of the undersigned, to whom Tenders, on the prescribed Form, must be sent on or before the 16th day of January, 1903, and endorsed "Gas-Works Extension."
The lowest or any Tender not necessarily accepted.
R. LOUIS RICCARD,
Town Clerk.
Town Clerk's Office,
South Molton, Devon, Dec. 16, 1902.

TO ENGINEERS AND IRONFOUNDERS.
THE Directors of the Sheffield United Gaslight Company invite TENDERS for the following materials for a RETORT-BENCH at their Neepsend Works.
TENDER No. 1.
For delivery only of 196 RETORT MOUTHPIECES 22 in. by 16 in. ⌂ shape, fitted with Self-Sealing Lids.
TENDER No. 2.
For delivery only of Cast-Iron ASH-PANS and FURNACE FITTINGS.
TENDER No. 3.
For the supply and erection of STEEL and IRON WORK for Stage-Floor, Girders, Buckstays, &c.
TENDER No. 4.
For the supply and erection of HYDRAULIC MAINS, ASCENSION-PIPES, GAS and TAR MAINS, &c.
Drawings may be seen, and Specifications and Forms of Tender obtained (on and after Dec. 16), from the Engineer, Mr. J. W. Morrison, at the Company's Offices, Commercial Street.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, addressed to the undersigned (endorsed as above), must be delivered, by post, not later than the first post on Monday, Jan. 5, 1903.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Dec. 10, 1902.

SHREWSBURY GASLIGHT COMPANY.
DESIRABLE INVESTMENT.
THE Directors of the above Company invite TENDERS for sufficient SHREWSBURY GAS CONVERTED ORDINARY STOCK to produce the sum of £14,176.
This Stock is entitled to a Standard Dividend of 5 per cent., payable half-yearly, and the Maximum Dividend has been paid for many Years.
January 30, 1903, is the last day for reception of Tenders.
Forms of Tender may be had on application to LLOYDS BANK, LIMITED, SHREWSBURY, or to the Company's Secretary, from whom any further Information can be obtained.
By order of the Directors,
WM. BELTON,
Secretary.
Gas-Works, Shrewsbury,
Dec. 18, 1902.

JAN 21 1903

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

[REGISTERED AS A NEWSPAPER.

VOL. LXXX. No. 2068.] LONDON, DECEMBER 30, 1902. [54TH YEAR. PRICE 6d.

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GAS PURIFICATION
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Telephone: 9144 LONDON WALL.

Telegrams: "NEILL, ST. HELENS."
Telephone No. 20 ST. HELENS.
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Established at the Commencement of Gas Lighting.
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For GAS, WATER, and STEAM.
STOCKS, TAPS, and DIES.
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Pendants and Brackets for Prepayment Meter Supplies.
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See Advertisements on pp. 1734 and 1772.
Cowan Branch: LONDON, MANCHESTER, EDINBURGH, & SYDNEY, N.S.W.
See Advertisement on Third Page of Wrapper.

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CANNEL & GAS COAL EXPORTERS,
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51 & 53, CASTLE STREET, LIVERPOOL.
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ESTABLISHED 1840.

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LLOYD & LLOYD, LIMITED.
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"METERS, LEEDS."
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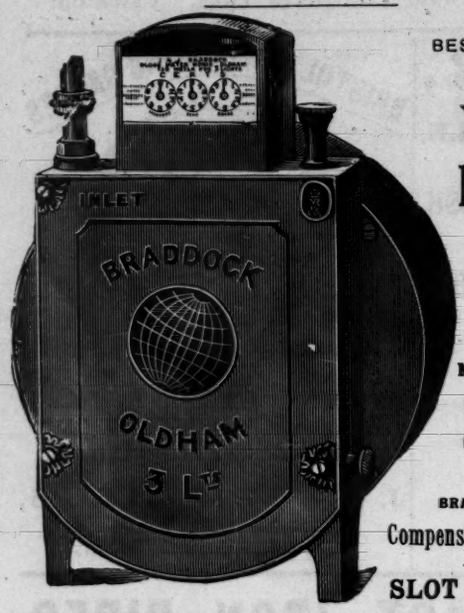
Telegrams: "*Metrique, London.*" **LONDON, S.E.**



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All Sizes In Stock.

METERS WITH WARNER and COWAN DRUMS.

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Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, Dec. 2, p. 1446.]

THE GLENBOIG UNION FIRE-CLAY Co.

THE LARGEST MANUFACTURERS OF GAS-RETORTS IN GREAT BRITAIN.

FIRE-BRICKS, BLOCKS, &c., &c., for RETORT-SETTING.

The SPECIAL BRICKS used in the Construction of Gas Furnaces now being introduced for Heating Retorts.

WORKS: Glenboig, nr. Coatbridge. Ltd.

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— 42 —

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HIGHEST AWARD *wherever exhibited.*

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

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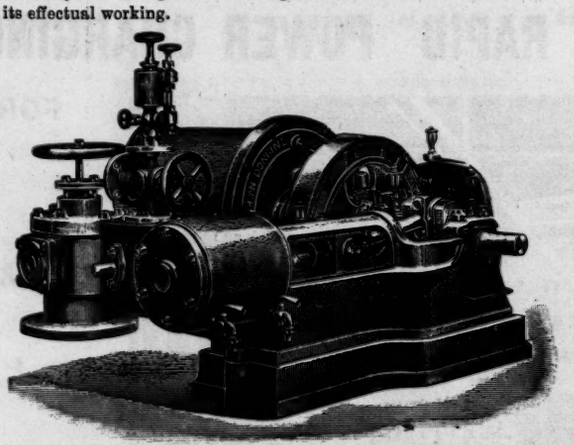
The Illustration below is from a Photograph of one of our **COMBINED EXHAUSTING PLANTS** designed by us for small Gas-Works, exhausting 2000 to 20,000 cubic feet of Gas per hour. We have already made about 200 such small Sets, all of which are **GIVING ENTIRE SATISFACTION.**

The **REGULATION** by means of the Hydraulic Regulator and Equilibrium Throttle Valve is now brought to **PRACTICAL PERFECTION**; and we can **GUARANTEE** its effectual working.

Very compact; the Engine and Exhauster being on one combination Base-Plate. All the adjustments and Self-lubricating arrangements are of the highest class; Workmanship and finish of the very best description.



We also make Exhausting Plants of capacities varying from 1000 to 750,000 cubic feet per hour, and have now made over 1000 Exhausters; our total Manufacture being over 60,000,000 cubic feet per hour, and our annual manufacture is now at the rate of 5,000,000 cubic feet per hour.

ORIGINAL MAKERS of the "Donkin" Internal Rack and Pinion Gas-Valve. Makers also of all other Types of Valves for Gas, Water, Liquor, Chemicals, and Steam. **GAS-VALVES** made from ¾ in. up to 48 in. diameter.

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C.80.c.

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXX. No. 2068.] LONDON, DECEMBER 30, 1902. [54TH YEAR. PRICE 6d.

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OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

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PRICES AND PARTICULARS ON APPLICATION.

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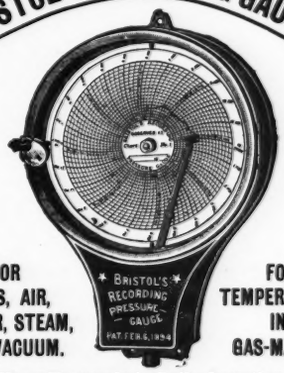

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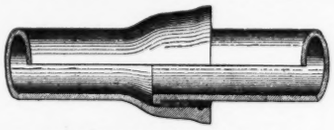

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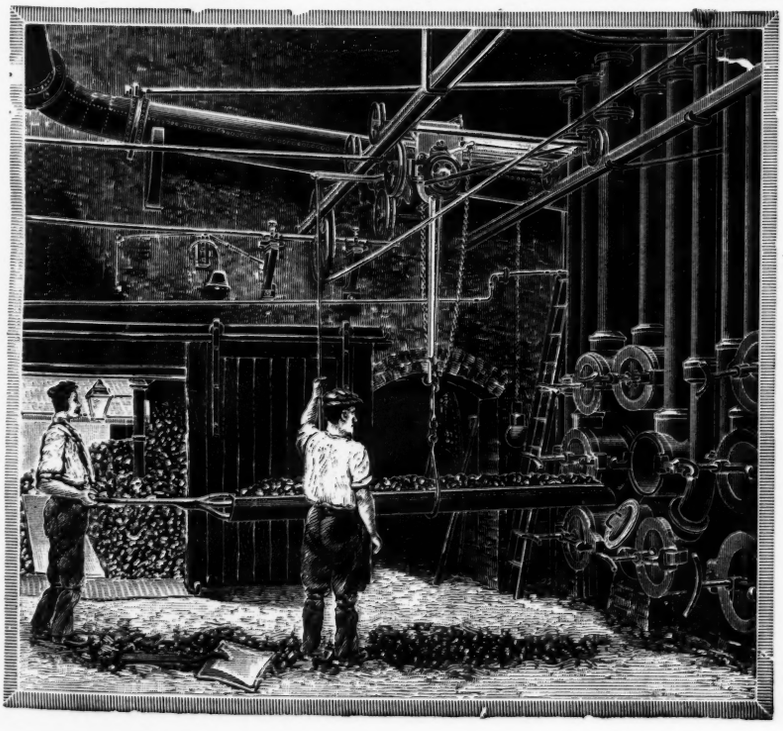

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COMPRESSED AIR DRIVEN
CHARGING AND DRAWING MACHINES;
COMBINED CHARGING AND DRAWING MACHINES; also
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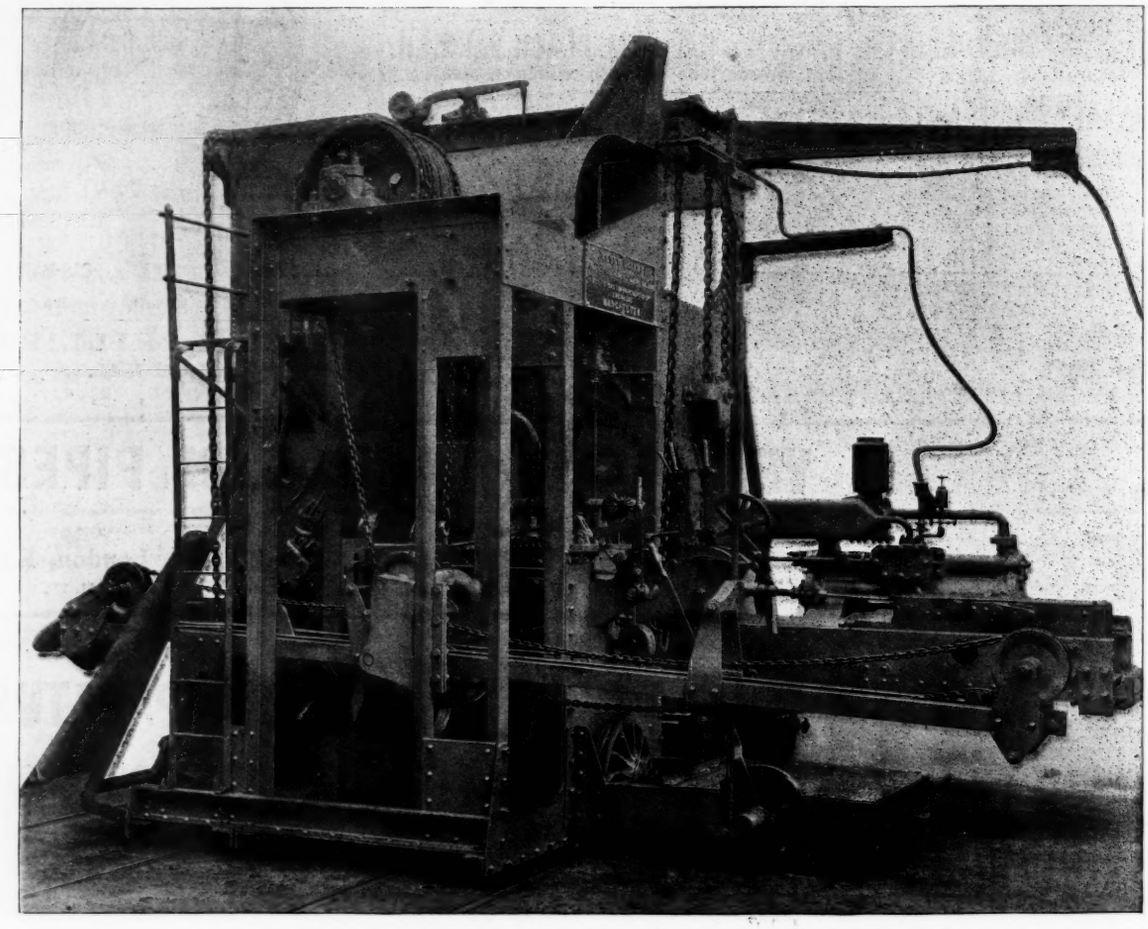

West's compressed Air Driven Charging and Drawing Machine, requiring only One Machine driver and one attendant to charge and draw the Retorts, attend to the Mouthpieces, and fill the Furnaces.

All classes of Coal can be efficiently dealt with by the West's Charging Machines, and the Retorts are charged evenly throughout with the full weight of Coal.

Retort Houses fitted with West's Regenerator Furnaces, Stoking Machinery, and Coke Conveyors reduce the cost of Carbonizing Coal to a minimum.

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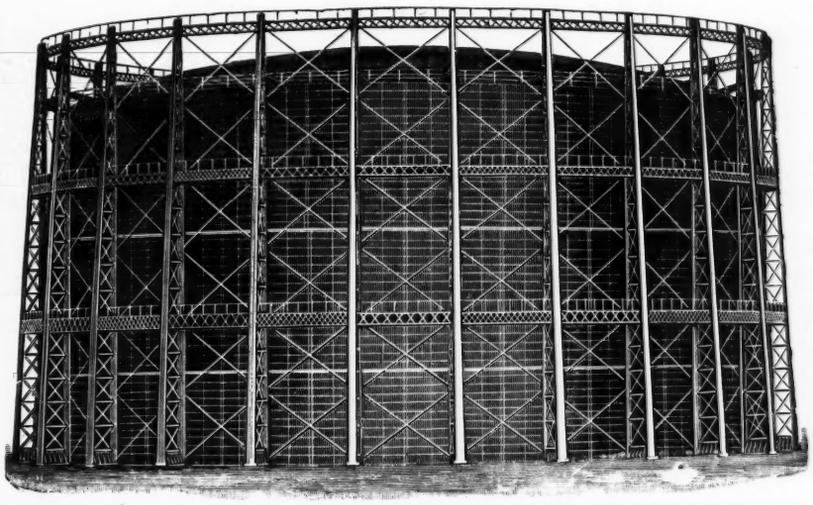

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RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS

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ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

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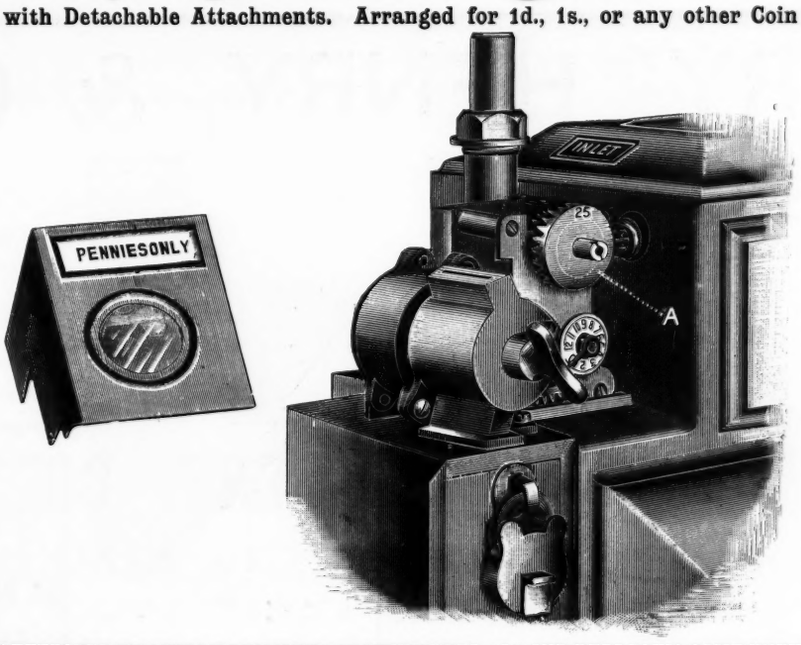
Patent Coin *Prepayment Gas-Meters*

Fitted with Detachable Attachments. Arranged for 1d., 1s., or any other Coin desired.



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Analysis: 12,600 Feet of 19-Candle Gas per Ton

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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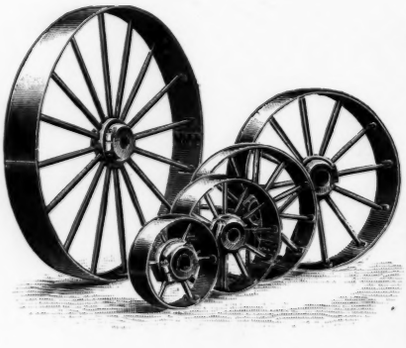

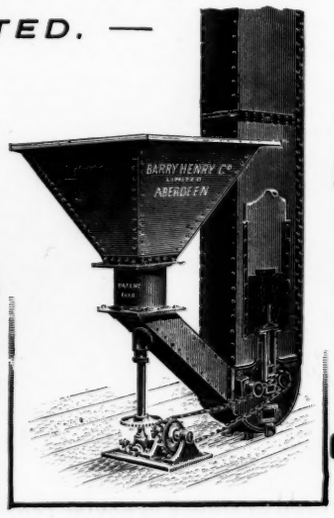

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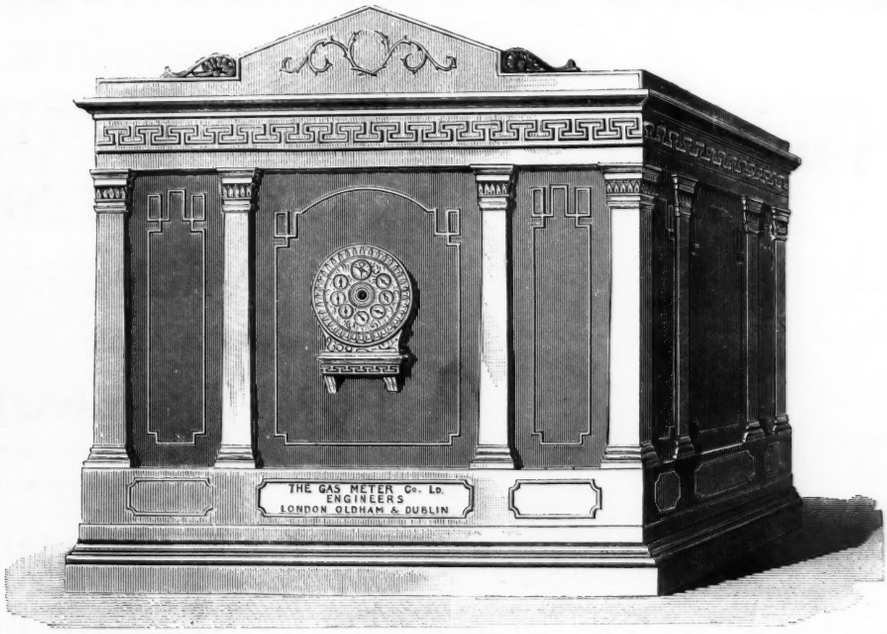

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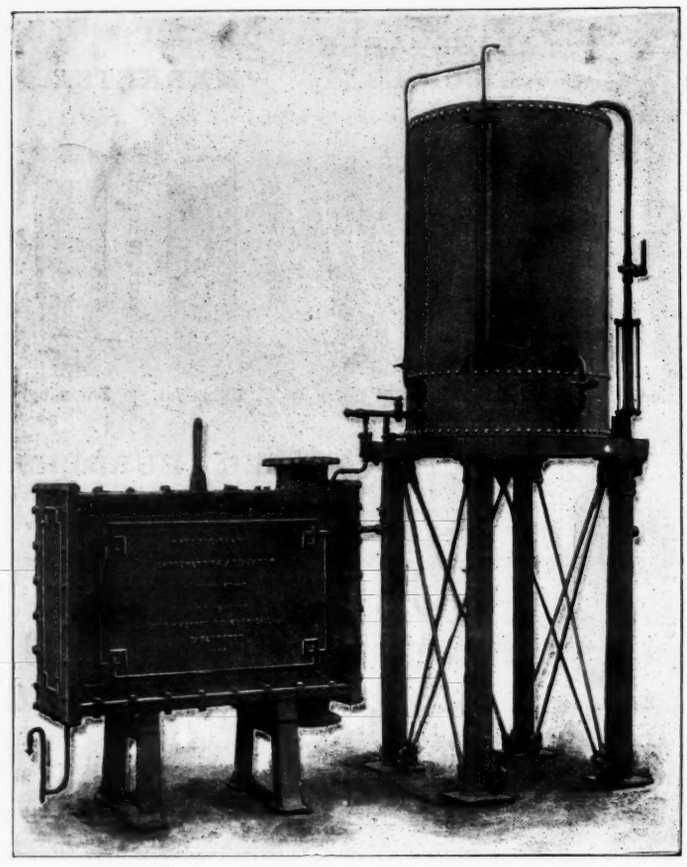

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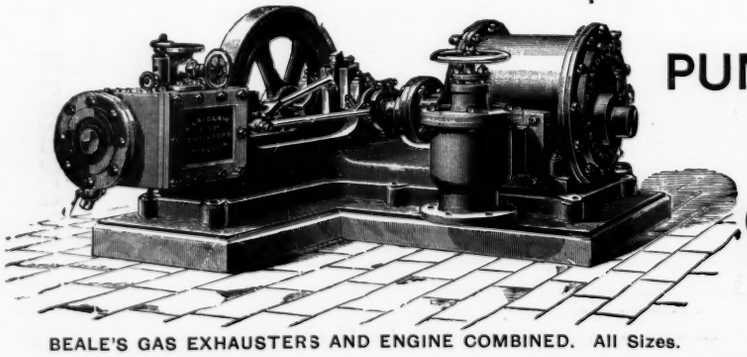

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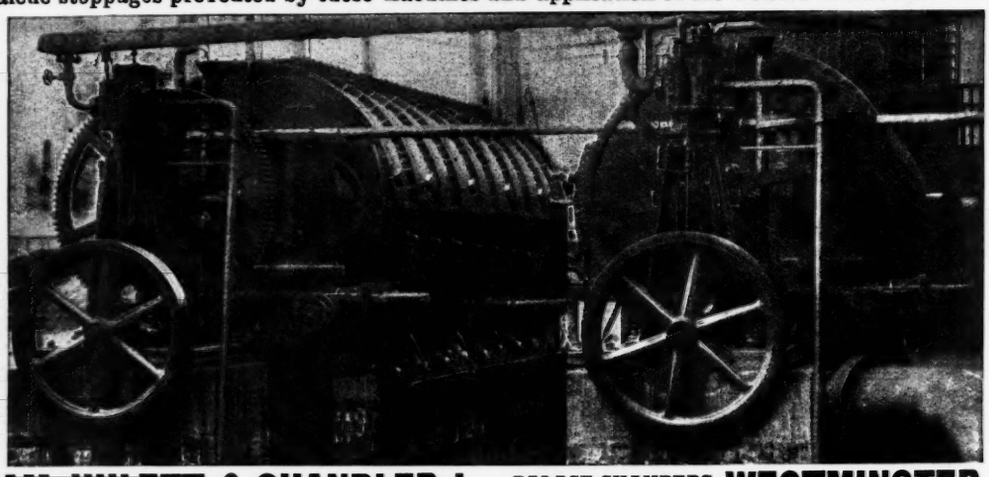

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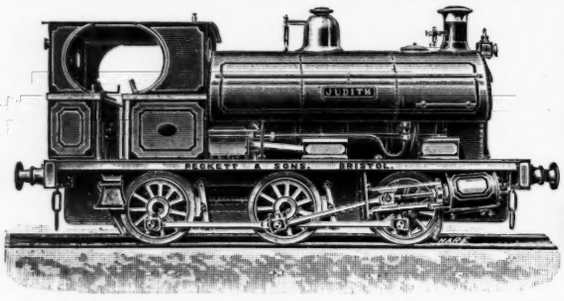

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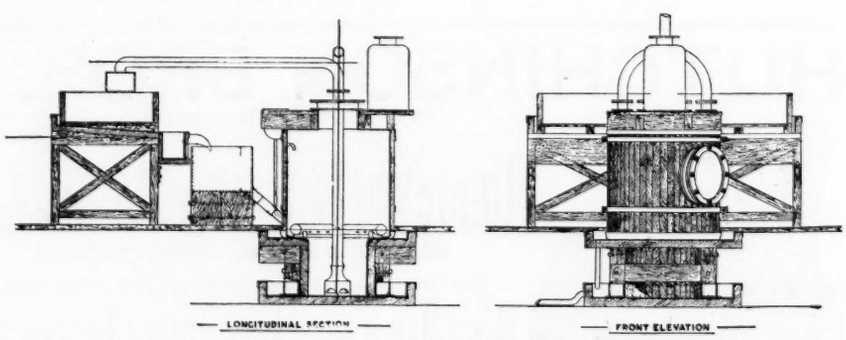

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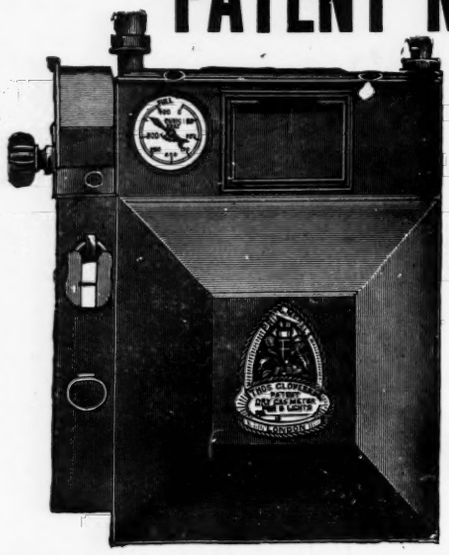

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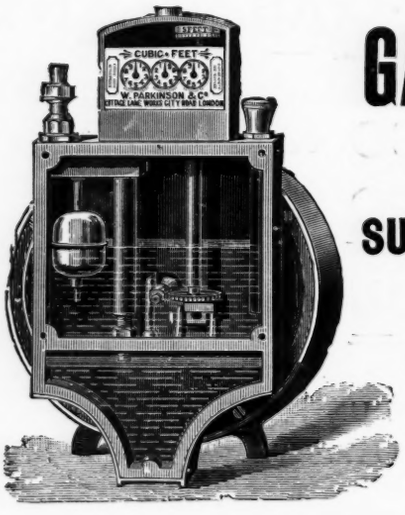

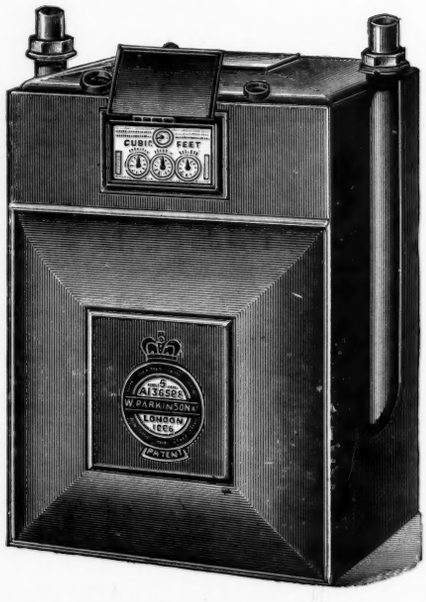

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THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to Capital Stocks, WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 6th day of January next, and will be RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company to be held on the 6th day of February next.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Dec. 24, 1902.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the Directors of this Company will OFFER the Sum of £100,000 ORDINARY STOCK to all the Gas Consumers and Persons in the employ of the Company, pursuant to the Provisions of the South Metropolitan Gas Act, 1901.

Full Particulars thereof, together with the price of such Stock, will be sent to the Consumers with the Gas Accounts for the Christmas quarter.

By order,
FRANK BUSH,
Secretary.

Offices: 709, Old Kent Road, S.E.,
Dec. 16, 1902.

NEW RIVER COMPANY.

ISSUE OF £250,000 THREE PER CENT. DEBENTURE STOCK "D."

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above Issue (being part of the £1,000,000 Debenture Stock "D" authorized by the New River Company's Act, 1897, bearing Interest at Three per Cent. per Annum, and Redeemable at par at any time after the expiration of Twenty-Five Years from the date of issue, upon Six Months' Previous Notice being given by the Company.

Particulars, Conditions of Sale, and Forms of Tender, may be obtained at the Company's Office, Rosebery Avenue, Clerkenwell, E.C.

Sealed Tenders are to be delivered at the New River Office, not later than Ten o'clock a.m. on Thursday, the 15th of January, 1903.

Reserve Price, £97 per cent.

The Stock is a lawful Investment for Trustees.

By order of the New River Company,
JAMES SEARLE,
Clerk.

New River Office, Rosebery Avenue,
Clerkenwell, E.C., December, 1902.

KINGSTON-UPON-THAMES GAS COMPANY.

SALE BY TENDER
OF
£2200
FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.
MINIMUM PRICE £100 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of the above Company to SELL by TENDER £2200 of 4 PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the Kingston-upon-Thames Gas Act, 1900.

Particulars of same, with Form of Tender, can be obtained on application to the undersigned, and Tenders must be sent in on or before Four o'clock (afternoon) on Tuesday, the 13th day of January, 1903.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower rate than £100 for each £100 Debenture Stock.

By order,
J. A. FRICKER,
Secretary.

Offices: 38, Thames Street,
Kingston-upon-Thames.
Dec. 24, 1902.

HORLEY DISTRICT GAS COMPANY.

SALE BY TENDER OF £2500 (ADDITIONAL) "B" CAPITAL STOCK.
MINIMUM PRICE—PAR.
RANKING FOR MAXIMUM DIVIDEND OF SEVEN PER CENT.

IN pursuance of the Horley District Gas Act, 1901, Notice is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £2500 of the above STOCK, to be paid up in full on or before the 14th of February, 1903; such Stock being a portion of the Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 12th day of September, 1901, under Powers of the above-mentioned Act.

Particulars and Conditions, with Form of Tender, may be obtained on application at this Office; and sealed Tenders must be sent in not later than Four o'clock in the afternoon of Friday, the 30th of January, 1903.

By order of the Board,
R. SEYMOUR TOBEY,
Secretary.

Offices: Station Road,
Horley, Surrey, Dec. 12, 1902.

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A Practical Treatise on the keeping of Gas Companies' Accounts.

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OF LONGWOOD.

LONDON:
WALTER KING 11, Bolt Court, FLEET STREET, E.C.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that a Special GENERAL MEETING of the Proprietors of the Riddings District Gas Company will be held at 30, Gracechurch Street, in the City of London, on Friday, the 16th day of January, 1903, at One o'clock in the afternoon, for the purpose of obtaining the Proprietors' approval of an application by means of a PROVISIONAL ORDER under the Gas and Water Works Facilities Act, 1870, and the Gas and Water Works Facilities Act (1870) Amendment Act, 1873, for Additional Capital by the creation and issue of New Ordinary Shares or Stock or New Preference Shares or Stock of the Company, or wholly or partially by one or more of those modes with power to borrow on mortgage of the Undertaking, and also the Proprietors' approval of the draft Provisional Order to be submitted to the Meeting.

Dated this 19th day of December, 1902.

ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, E.C.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

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MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 13, 1903, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £5000 "D" CAPITAL GAS STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 13, 1903, at Two o'clock, in Lots.

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By order of the Directors of the
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NEW ISSUE OF £5000 ORDINARY STOCK.

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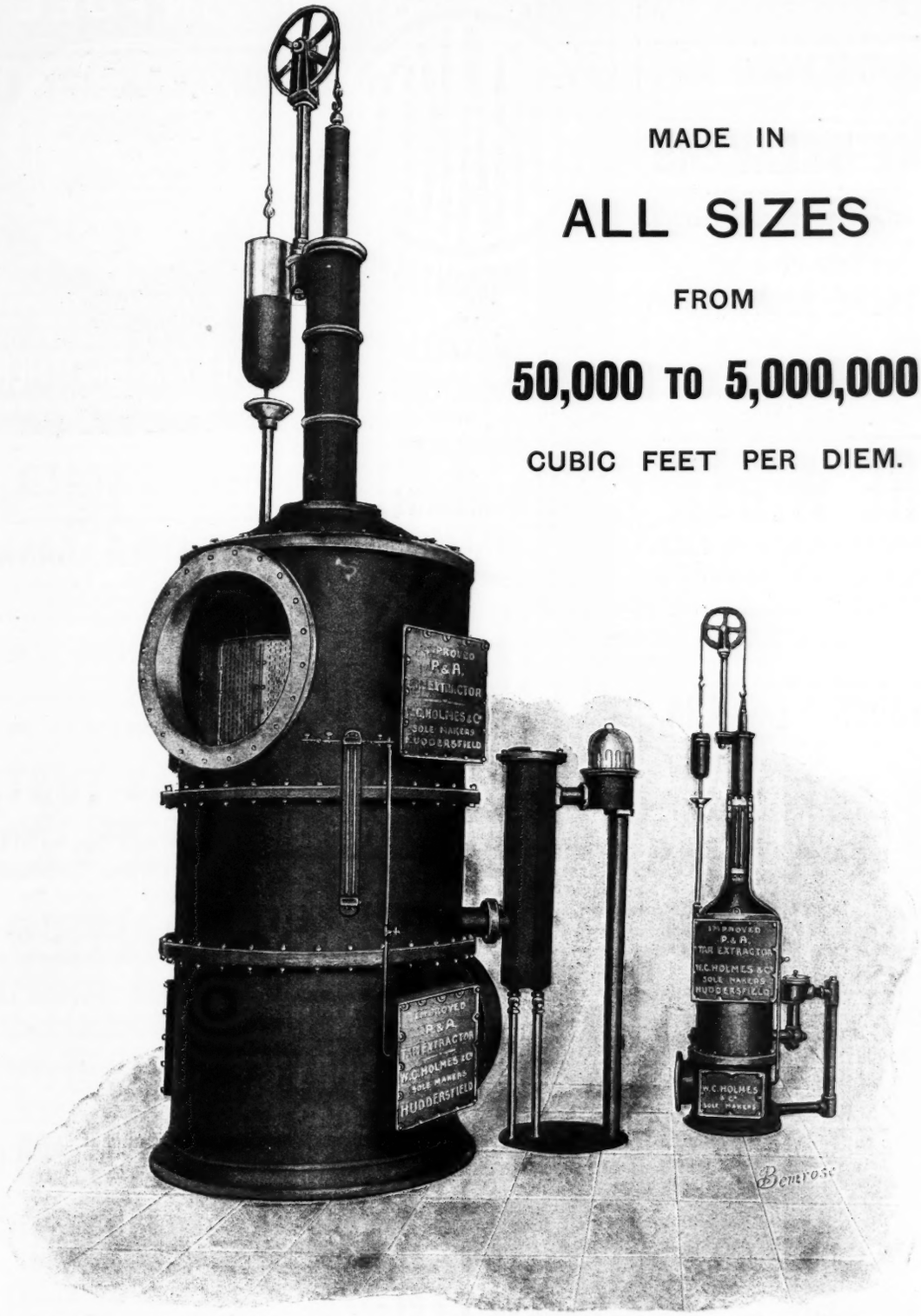

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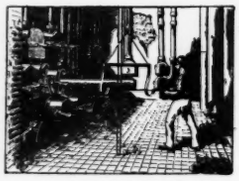

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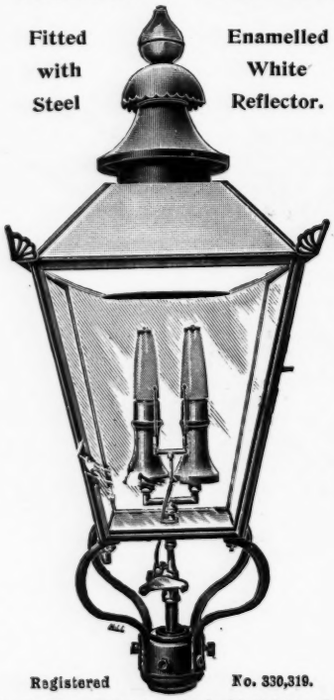

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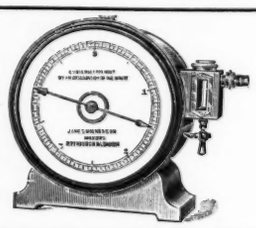

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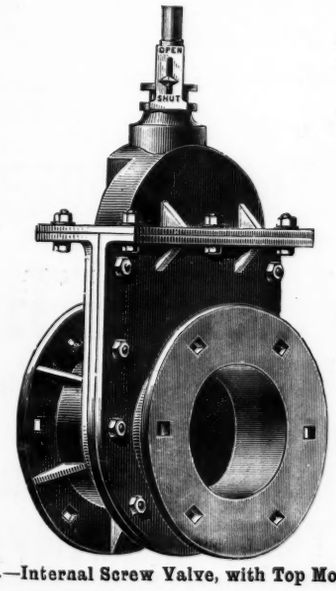

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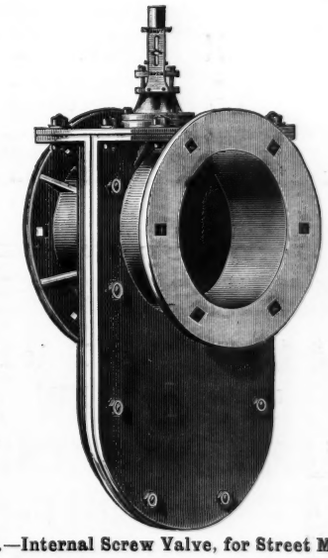
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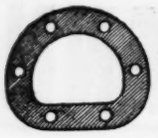

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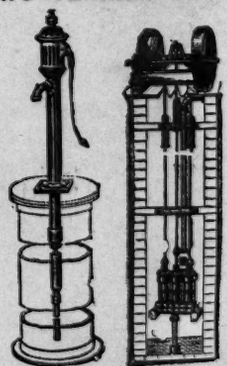

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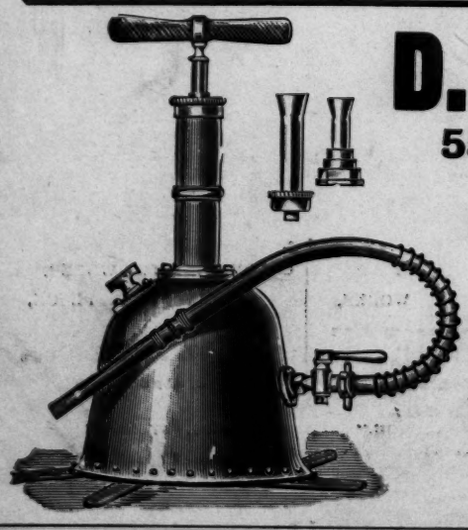

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